# Products finishing

FRED W. VOGEL, Editor

Volume 6 JULY, 1942 Number 10

**Published monthly by Gardner Publications, Inc. 431 Main St. Cincinnati, Ohio**

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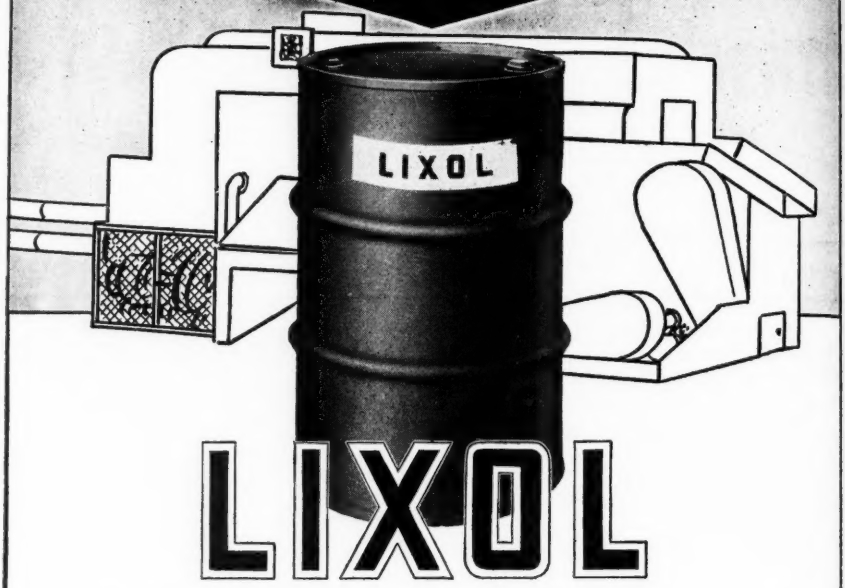


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# Products Finishing

WE have confounded the predictions of our enemies, we have notched up our belts, we have tightened our economy so that almost nothing needed for war is wasted on nonessentials of ordinary living. And now, as we gather our forces for the supreme effort which shall overthrow Axis tyranny, we are fighting another sort of waste. The waste we are fighting now is waste of what we call "manpower" but which actually embraces almost everybody—man or woman or adolescent child—in the U. S. A.

The manpower mobilization program, its goal a job for everyone and everyone in the right job, is one attack on the problem of manpower waste. And another line of attack is that which hits at the waste of war manpower caused by accidents and ill health. Ill health and accidents fight for our enemies on the production front and the home front just as on the field of battle. The malarial fevers which seeped from the steaming jungles of Bataan were allies of the Japanese, and disease and illness are their allies—and allies of the Nazis, too—in the war production centers of America.

But the compulsion to remain fit extends beyond the camps of our Army and the warships of our Navy and the walls of our factories. It is a compulsion laid on all of us. Indifferent health means indifferent morale and indifferent morale is an invitation to defeat. The weapons with which ill health is fought on the home front are weapons familiar to every individual — proper food, proper rest, proper exercise, proper medical care.

Illness and injury cost us 6,000,000 work days every month—work days which would have brought victory over the Axis that much nearer. Let's do everything we can to keep fit and thus reduce the manpower loss to a minimum.

JULY, 1942 Vol. 6, No. 10

# *Infra-Red Baking of Ordnance Finishes*

By THOMAS P. CUSACK, JR.

C. M. Hall Lamp Company, Detroit, Michigan

AMERICAN industry, now definitely on the offensive, is making great strides in meeting the requirements of our military forces. Though industrialists are faced with insistent demands for speed and increased production, they must conserve, and efficiently utilize labor, space, materials and power. This is particularly true in finishing departments where curing or baking of modern synthetic finishes has become an industrial bottleneck.

It is quite generally recognized that any finish that can be baked at all can be baked with infra-red radiation. It was formerly thought that there might be some special catalytic effect at work that would account for frequently very remarkable

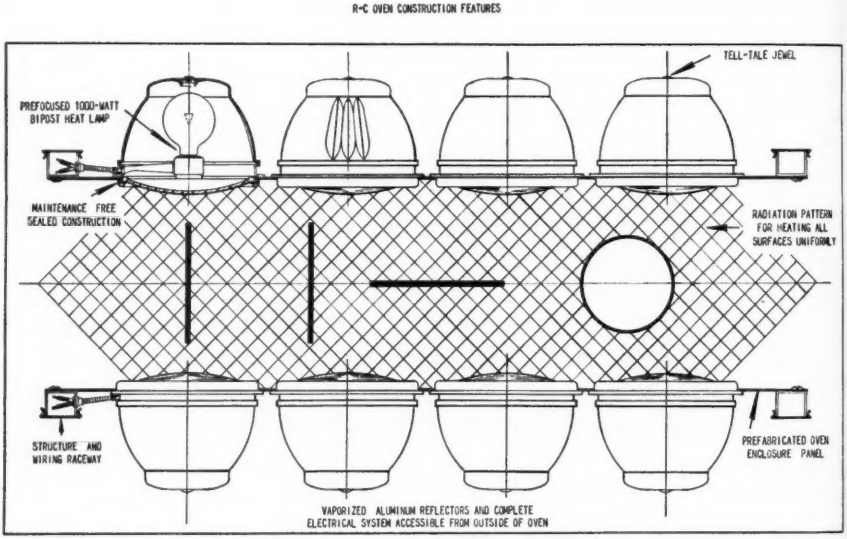
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**Fig. 1—A schematic diagram showing an oven cross-section and heat distribution.**

**TABLE I**

| Specification Number | Coating | Main Component | Uses | Radiation Drying Schedule |
|---|---|---|---|---|
| P X S 783 | Zinc Chromate Primer | Glyceryl Phthalate | Ammunition Corrosion Inhibitor Corrosion inhibiting priming coat on metal structural parts | 30 sec. |
| Army Air Corp 14080 | Zinc Chromate Metal Primer | Glyceryl Phthalate | | 30 sec. |
| Navy Airo P-276-Z | Zinc Chromate Primer | Glyceryl Phthalate | Corrosion Inhibitor for use on aluminum alloys or steel | 20 sec. |
| QMC-ES 3596 | Rust Inhibiting Primer | Glyceryl Phthalate | Army vehicles, artillery components, tanks and miscellaneous items | 4½ min. |
| HQD - ES 680 | Rust Inhibiting Primer | Glyceryl Phthalate | Army vehicles, ordnance, artillery components, miscellaneous items | 4½ min. |
| Army 3-162A | Lacquer for Ammunition | Nitro Cellulose | Protection and identification of ammunition | 30 - 40 sec. |
| Army 3-106E | Acid Proof Black | Bituminous Base | Inside coating on shells, bombs and land mines | 4½ min. |
| Army Air Corp 14105 | Camouflage Lacquer | Nitro Cellulose | Camouflage over primer | 30 - 40 sec. |
| Navy E 5 e | Aircraft Enamel | Glyceryl Phthalate | Exterior coatings for metal and fabric, also aircraft parts | 8 min. |
| Navy E 6 e | Black Enamel | Glyceryl Phthalate | Aircraft Engine Castings and Instruments | 8 min. |
| QMC ES 4746 | Lustreless Olive Drab | Glyceryl Phthalate | Army vehicles, tanks, pontoons and Artillery Components | 4½ min. |
| HQD ES 680 | Lustreless Olive Drab | Glyceryl Phthalate | Automotive products | 4½ min. |
| ES 5106 | Stenciling Enamels | Glyceryl Phthalate | Lettering on exposed surfaces | 3 min. |
| T 1103 | Olive Drab Primer | Glyceryl Phthalate | Portable Landing Mats | 5½ min. |

This table gives the radiant heat drying schedule of various ordnance finishing materials.

accelerations in baking time that resulted from using radiant heat lamps. However, a critical examination of the baking process will show that the reduction in baking time depends largely upon two factors, one a rapid temperature acceleration within the work and second a selection of materials favoring higher working temperature. In common with most chemical reactions, an increase in baking temperature results in a decrease in reaction or baking time and, of course, the more rapidly the temperature is attained the less total time is required for the process.

The finishes best suited to the speeding up process are the coatings formulated with synthetic resins. The term synthetic as used in the protective coating industry is usually restricted to material based upon alkyd, glycerol phthalate, urea and phenolic type resins. They dry both by oxidation and polymerization, and are used in both air drying and baking enamels. Though synthetic enamels react most favorably to radiant heat baking, the process is not limited to such enamels. Radiant heat will also speed the evaporation of solvents from the lacquer type finishes and at the same time eliminate blushing difficulties. Oleoresinous finishes are prepared

from natural drying oils and from various natural resins and synthetic resins. They may dry both by oxidation and polymerization. They are made in many varieties for both air drying and baking. In oleoresinous enamels radiant heat promotes oxidation and at the same time accelerates any accompanying polymerization.

Most military finishes in common use today, both by the Army and the Navy, fall into two general classes, lacquers or synthetics. There are very few specifications which require oleoresinous vehicles, and when specified, it is because of the peculiar nature of its use. Since the great majority of military finishes are formulated with synthetic resins or are of a lacquer type, radiant heat equipment is ideally suited for their baking. A listing of the most common specifications and their uses accompanied with a comparison of the conventional baking cycle to the radiant heating cycle will clearly demonstrate this statement and these have been compiled in Table I.

An examination of radiant heat drying schedules shown in Table I emphasizes the importance of controlled heat density radiant equipment in this present emergency. If speed, space saving, safety and economy are to be the watchwords of war production, then radiant heating holds the answer to many industrial problems.

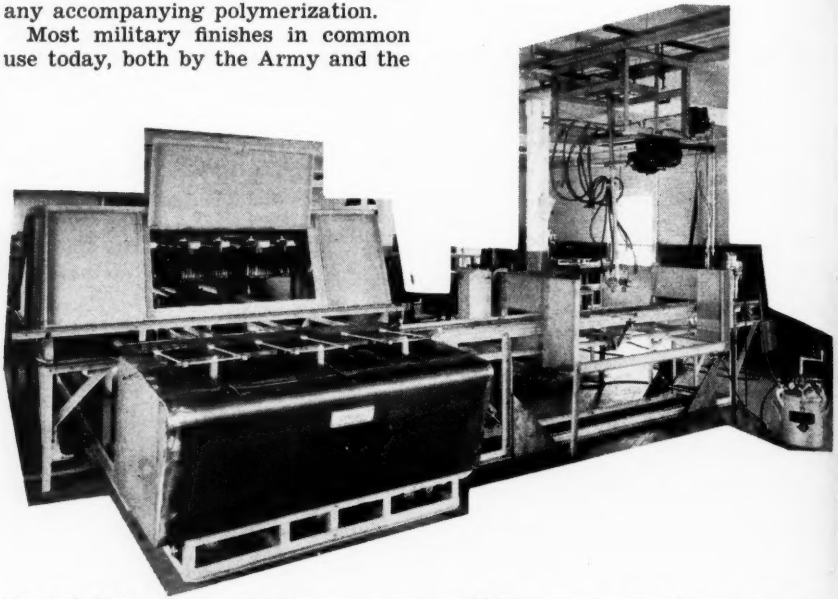

Fig. 2—A high production finishing setup requiring 15,000 linear feet per day. The finishing material is automatically sprayed on the work at high speed. As the work approaches the infra-red oven it is diverted in short lengths at a right angle and enters the oven at a reduced speed.

### Why Infra-Red Heating Is Different

Why does radiant heat fulfill the need? How does radiant heat work? How is it different from conventional baking methods? Why is it that baking cycles based on hot air tempera-

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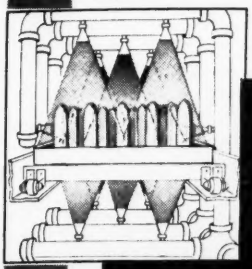

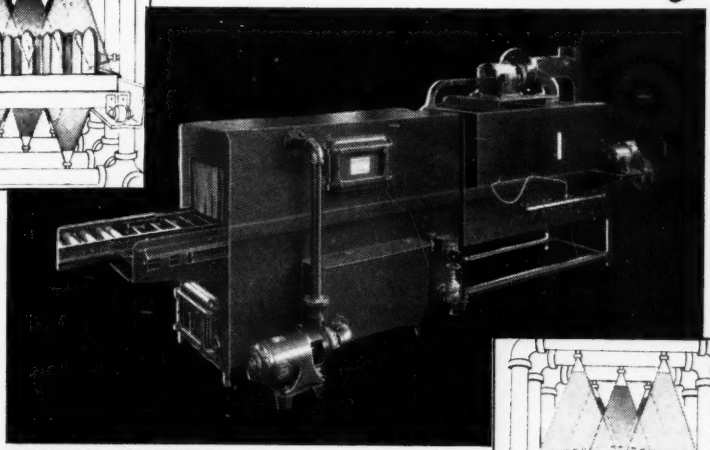

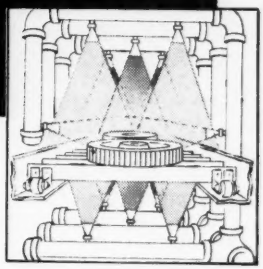

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ture do not hold for radiant heating? For the answers to these often repeated questions, let us examine the paint baking process and the mechanics of heating.

If you design a radiant heat oven and a conventional oven so that the time-temperature curve of the work is the same, and please note that I say **time-temperature curve of the work itself,** little if any, difference will be noticed between the baking effectiveness of the two ovens. If the **temperature of the work** is then increased in both systems, the baking time will decrease. In such a process it will be observed that the effective curing of a protective coating is a matter of efficient heat transfer.

The transfer of heat from one body to another occurs in three ways, by convection, by conduction, by radiation or by any combination of the three. Conduction heating requires direct contact between the source of heat and the body to be heated. Convection employs a liquid or gaseous medium by means of which the heat is transferred from one body to another. While on the other hand, radiant heat requires no physical contact between two bodies or a material connecting link between them.

Most industrial heat processes now rely on heat transfer by convection. In convection oven practice, heat transfer is directly proportional to the temperature difference existing between the working surface and the surrounding air. Air movement helps eliminate the insulating influence of gaseous films adjacent to the work and thus directly increase the heat transfer. The rate of transfer diminishes as the temperature of the work approaches that of the surrounding air and when the state of equilibrium is reached no further heat transfer is effected. The temperature rise is also influenced by the mass, conductivity and the specific heat of the material. The available radiant energy in a convection system is largely converted into convected heat by the heat transfer before it is gainfully employed.

Infra-red heat energy is delivered directly from the source to the intended work. Infra-red energy is not manifest in the form of heat until it has been intercepted and absorbed in the material to be heated. Some materials will transmit these rays without converting them into heat, for example, infra-red will pass through air without heating the air to any appreciable extent; certain types of glass will transmit a high percentage of the infra-red rays. On the other hand, infra-red rays are stopped and absorbed by thin layers of water while other materials such as processed aluminum and bright virgin gold are excellent reflectors of infra-red energy.

In the transfer of radiant heat, the rate of temperature rise is directly dependent on the ability of the surface to absorb the energy and the concentration or density of the energy received. Mass, specific heat and conductivity will affect the temperature rise and the uniformity of temperature within the material being heated. As in convection heating, however, the mean temperature attained is solely a matter of equilibrium, and in radiant heating this occurs when the rate of heat loss to the surrounding atmosphere is equivalent to the rate of energy input. Air temperature which is not important in the original heat transfer becomes important because of its influence on losses. The heat losses to the air, in general, depend on the temperature difference between the surrounding air and the heated surface. Since radiant heating equipment is designed for a rapid rise of temperature and the maintaining of the temperature, any energy absorbed by the material in excess of the surrounding air temperature will be readily lost from the

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system by convection resulting in poor utilization of the otherwise effective electrical energy. The importance of elevated air temperature in radiant ovens thus becomes apparent. Maximum utilization of radiant energy is realized when the air temperature approaches the intended baking temperature. Subordinate surfaces not otherwise exposed to the radiant energy may thus be partially cured. At the same time a wide range of latitude is permitted between variations in mass, color, size and shape of product.

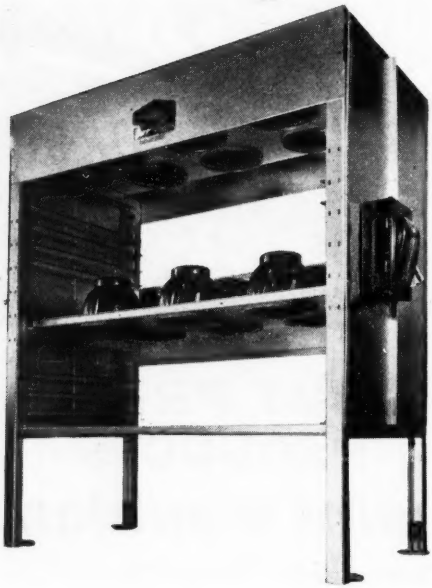

Fig. 3—This double action oven can be installed single or in tiers. The structural channels also serve as wiring raceways with preformed panels completing the enclosure.

Today the by-product, convection heat of a radiant heat oven, is retained by fully enclosing the entire system. A secondary ventilation system gainfully employs the derived warm air while at the same time assures the proper discharge of exhaust gases. With the combined use of radiation and convection, predetermined temperature cycles are most economically developed with multiple zone ovens. The most typical zone oven would be that for the baking of a normal synthetic enamel. In such an oven there would be four zones. The entering zone could be called a preheating section in which is employed the hot air taken from the radiant system. in this section there are no radiant heat sources. The pre-heating zone of a radiant-convection system would be used for a two-fold purpose, for the preheating of entering work with the hot air, thereby obtaining a greater overall thermal efficiency and at the same time to take off the high boiling volatile solvents.

The work would then enter a zone of high energy concentration in which 1,000 watt radiant sources are employed. The use of high concentrations of radiant heat in this zone develops a rapid rise to the required baking temperature. From this high concentration of radiant energy the work would enter a zone of low concentration. In this zone, the low concentration is obtained by the proper spacing of similar 1,000 watt lamps on wide centers. During this interval of low concentration the previously attained temperature is held constantly for any prescribed period of time. It is during this interval that the heat is evenly distributed through the mass by the thermal conductivity. This cycle may be short or prolonged as determined by the requirements of the coating.

The work would leave the low concentration zone to enter what may be called a heat retention section in which there are no lamps. The heating cycle is completed during this

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period by the utilization of the derived convected heat and by the residual heat in the product itself. Although in this example we have spoken of but four different zones, each contributing to a prescribed baking cycle, it is quite possible to have any number of zones with variations in sequence, as for example, in an oven specifically designed for baking wrinkle finishes where, to assure the most rapid formation and cure of the desired wrinkle finish, the high and low heating zones are reversed. No auxiliary instruments or temperature control equipment are necessary to maintain consistent results, although variations can be effected with voltage control or switching as desired.

### Oven Design

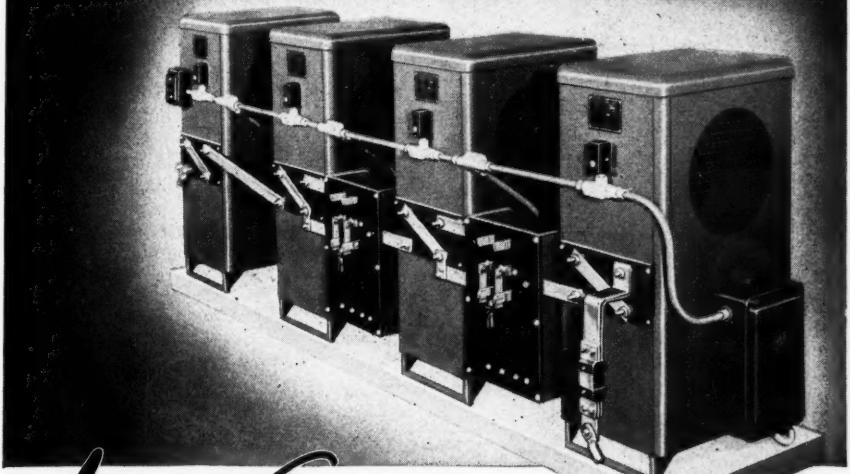
The fact that a proposed manufacturing operation uses heat in some part of the process does not allow the engineer to recommend any oven design indiscriminately. Radiant ovens should be designed to meet the paint specifications, not the paint to the design of the oven. Of the many factors that the heating engineer will consider in determining what manner of heating is best suited for the process under consideration, the following are probably the most important: (1) Physical dimensions of the piece to be heated; (2) Thermal characteristics of the material comprising the piece; (3) Temperature requirements of the process; (4) Time cycle requirements to effect completion of the process; (5) Method of handling the product to assure essential space utilization; (6) Safety considerations; (7) Space limitations; (8) Control and existing investment to be utilized. Long years of experience have taught furnace and oven manufacturers the necessity of acquiring sufficient data before ascertaining and recommending an oven for any manufacturing process. Radiant heating is no exception.

In the design of a radiant-convection system, much emphasis is placed on the judicious application of the infra-red sources and the utilization of the heated air. The same amount of consideration must be given to the arrangement and handling of the work parts to be heated. Since only that part of the energy which is intercepted and absorbed can be useful in raising the temperature of the work and in maintaining the temperature of the work, it follows that objects should present as much surface as possible to the lamps. This usually implies an engineered arrangement of the work on a conveyor line or on trays in a batch oven. Open hanging centers should be avoided. Proper hangers should be designed for the handling of small parts. Formerly, it was thought that such items as portable landing mats, small gun parts and window frames could not be finished and baked satisfactorily in a radiant heat oven. Now, by properly hanging the parts in a well executed design of a radiant-convection oven such open work is as efficiently baked as most general items.

In the application of radiant heat to insulating materials and to complicated shapes and irregular surfaces, there is the problem of uniform heat deliverance to all working surfaces so as to insure consistent and uniform temperature, and consequent uniform results. New optical principles have had to be introduced to avoid serious variations in heat density over a practical range of working distances within the oven. Employing such optical principles and by utilizing radiant and convected heat properly it is now possible to bake the protective coating on any shape or size object in a well executed oven.

Radiant-convection heat equipment

# RECTO-PLATERS



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presents several unique characteristics which are of prime importance in considering its use. In addition to its low initial investment and operating costs, there are several mechanical

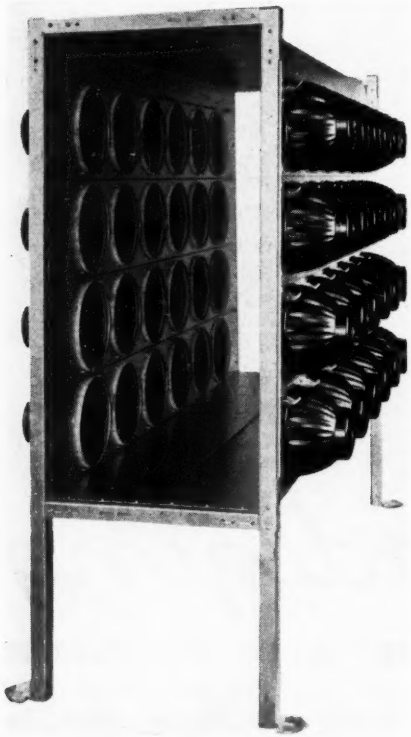

Fig. 4—Utilizing by-product convection as well as radiant infra-red heating, this new type of vertical, enclosed oven accommodates medium calibre guns which travel through, suspended from a conveyor, at a comparatively high speed.

characteristics that affect the economy of this form of heating in a more indirect manner. These features include such items as the following: (1) No warm up period; (2) Greater coordination with other processes; (3) Flexibility; (4) Savings in floor space; (5) Cleanliness; (6) Consistency of results and (7) The ability to observe the operation of the oven at all times. All these factors are prime considerations in a radiant-convection oven. Stand-by losses with this type of equipment are at an absolute minimum inasmuch as the oven need not be operated for any length of time prior to its intended service use. The ability of a radiant convection type oven to respond instantly allows for greater coordination between the finishing room and other production processes. In the event of a short or a prolonged lag in production the oven can be turned off, allowing work to remain in the oven without damaging results.

By virtue of the simple construction involved, the flexibility of a radiant-convection type oven is desirable. Varying work temperature may be had and maintained, varying baking cycles are possible by the proper circuiting of the electrical energy. The construction is so inexpensive that the manufacturer who must consider extraordinary changes in either items produced or the volume of production need have no qualms about changing the length or size of his radiant-convection oven with a change in his manufacturing procedure.

In some instances, it is desirable to increase the production capacity of a conventional oven already in use. A radiant-convection oven is especially adapted to meet this problem of expansion because it can be fabricated in such a way as to supplement or complement present heating facilities. The ability to coordinate radiant-convection oven with existing equipment has been used to advantage by many manufacturers. This particularly applies when consideration must be given to expenditures made for equipment to expedite the production of military items. Although radiant-convection equipment has proven its usefulness in this present emergency, it

made possible with the

This gigantic, 3-level ventilating equipment—a multiple assembly of Mahon Hydro-Filter Units, combined with a mammoth Mahon Filtered Air Supply System—performs a double function. It clears the room, at three separate levels, of dangerous overspray and fumes and continuously floods the entire space with washed and filtered air, maintaining an equalized air flow throughout the room. Enclosure is 150' wide, 100' long, 35' high, the largest spray booth and ventilating system ever designed and installed, so far as is known.

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must be remembered that the same equipment can be used in normal times. Little or no change in equipment purchased for the production of military needs may be necessary.

In almost every installation a saving in floor space has been obtained by short cycles and proper arrangement of work on conveyor systems. Radiant convection ovens have been designed to permit many passes of work within the oven. Wherever possible, radiant-convection ovens because of their light weight have been suspended from the ceiling, thus releasing to the manufacturer floor space that was previously unavailable to him.

Radiant-convection ovens are designed with the entire electrical system external to the oven. Wires are carried in covered channels to a central control panel. Complete control of the entire system in any desired sequence is made possible by interlocking devices. The conveyors, the ventilating system, the spraying operation and the heating are interlocked so that a failure at any point will stop the system, thereby preventing production losses and avoiding any unsafe conditions.

To further the interest of safety, all equipment used is of an approved type and is installed in accordance with the National Electric Code. Ovens are properly ventilated to remove the solvents in paint baking and to remove flammable dust and waste in drying and heating operations.

The most popular use for radiant heat is that of baking enamels on sheet metal. However, it must be noted that due to a saving in time, space and other costs, and due to cleanliness, safety and ease of control, radiant heating is today in common use for a great variety of applications where working temperatures need not exceed 500 degrees.

Case histories indicate that moisture drying with radiant heat has been maximum in those cases where moisture is held on the surface or within a thin film of material. Finishes are being baked on heavy ordnance equipment with appreciable saving both in heating and the cooling time. The heating of thermo-plastic sheet materials prior to forming has been quite successful. The melting of paraffin compounds on plated objects by means of radiant heat has become an accepted practice, as has the shrink fitting of gears and bearings. The baking cycle for insulating varnishes has also been substantially reduced as, for example, on motor armatures and stators.

In short, three brief years has seen the commercial development of radiant heating carried to a point where it is now accepted as a full fledged tool of modern industry. Reflectors and lamps have given way to ovens and the challenge once presented by introduction of synthetic finishes is now returned by the electrical industry in a form which no production executive can afford to overlook.


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# *Stabilization of Chlorinated Solvents for Metal Degreasing*

By C. F. DINLEY*

IN the cleaning or degreasing of metals by the use of hot solvents, marvelous results are being obtained. This covers all metal industries and all metals. It would be safe to say today that any plant which is set up to fabricate metals—ferrous or non-ferrous — is conversant with or has a hot metal-degreasing system.

Developments in the theory and practice of stabilization of chlorinated solvents, especially for the metal cleaning industry, are discussed by the author, who pioneered in this field. His researches were rewarded with the original basic stabilization patents, as well as many subsequent ones.

The only safety solvents suitable for hot metal-degreasing are the chlorinated solvents. This method of cleaning takes advantage of their high vapor weight, low specific heat, and non-inflammability. While not a panacea for all metal cleaning, solvent degreasing is the only important advance made in the cleaning of metals for the past twenty years.

In metal degreasing with chlorinated solvents, the metal leaves the degreaser entirely free from liquid. The hot, dry metal may be stored or processed immediately, as there are no stains, and no discoloration, the metal being immediately ready for inspection, painting, and in many cases plating. The degreasing equipment requires a minimum of space, heat, and water. The operation is much easier, neater and quicker than other cleaning methods.

In the early stages of metal degreasing, the design of a suitable apparatus that was open at the top or ends to permit the entrance and exit of the work took up most of the development.

### The Need for Stabilization

When the writer's laboratory tests on the various chlorinated solvents under consideration for metal cleaning were well along, the rather startling fact was revealed that these solvents had a tendency to split up into other chlorine products, amongst which was hydrochloric acid. This fact indicated that research was

* *Vice-President in Charge of Engineering, Manufacturing and Research of Detroit Rex Products Company, Detroit, Michigan.*

needed to prevent such occurrence, as the metal degreasing process would be of no commercial value until this difficulty was overcome.

In manufacturing the degreasing apparatus, commercial steel sheets, plates and shapes were to be used, as this type of steel is readily available and the original cost is low. However, in the presence of even a trace of hydrochloric acid, the application of steel or other commercially economical material would be precluded. The action of hydrochloric acid on ordinary metal results in the solution of the metal with the formation of a chloride of the metal dissolved. The effect of some metallic chlorides on the chlorinated solvent is catalytic, which results in a rapid decomposition of the solvent with liberation of heat, and the formation of gaseous hydrochloric acid in large and copious amounts. The deposition of carbon and other products also resulted from the decomposition of the solvent.

The effect on the degreaser itself was to completely dissolve the steel sheets of which it was made, particularly at the liquid level. The complete disintegration of steel sheets $\frac{3}{16}$ in. in thickness was not unusual. Furthermore, the gaseous hydrochloric acid vapors liberated by this decomposition escaped from the machine and circulated through the room. These acid vapors affected all metal parts within a radius of 200 ft., causing discoloration and corrosion.

The decomposition of the solvent was caused by light, water, heat and some non-ferrous metals, as well as by fatty acids, and so on. A search of literature, text books, and other printed matter brought to light that this problem of decomposition had been completely ignored.

Research was immediately started along various indicated lines. Fractions of the commercial chlorinated solvents were brought to closer boiling ranges, but this did not help. Original containers were imported direct from foreign countries, but on

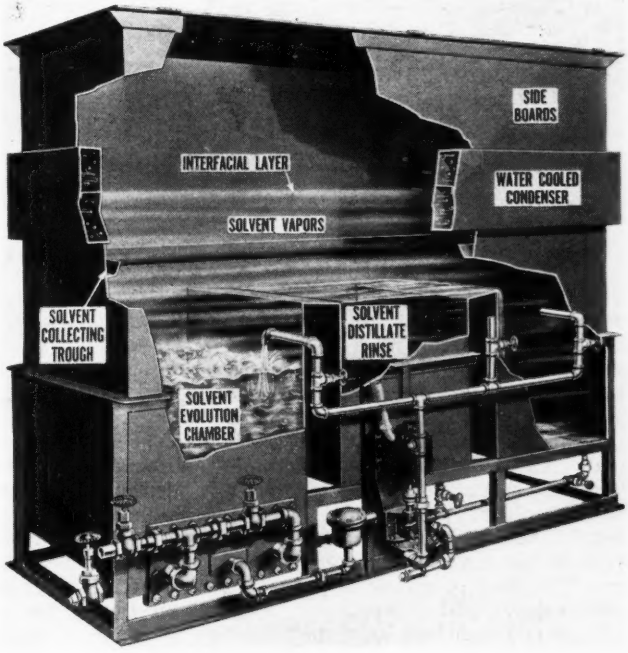


Fig. 1 — Cutaway view of a three-dip, hand-operated, immersion type degreaser arranged for steam heating. Note relative position of condenser, vapor layer, and side boards above vapor zone.

the whole these were consistently of poorer quality than the same solvent made in the United States.

After these facts were brought to light, work on the problem of stabilization began in earnest. Additive as a means to immediately neutralize any hydrochloric acid formed, but again this proved worthless. These materials were in the nature of a corrective, rather than a preventative measure, and were only effective in

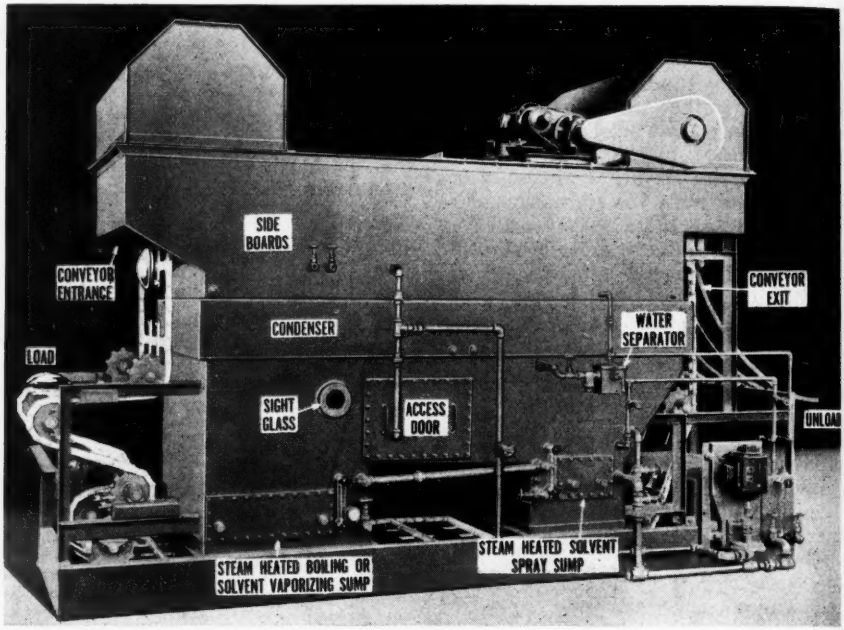


Fig. 2—Conveyorized degreaser open at both ends. Water separator is located in distillate return line from solvent collecting trough.

chemicals, such as those that were easily chlorinated were first employed, the thought being that under the heat of the degreasing process the easily chlorinated material would prevent the formation of hydrochloric acid. Any objectionable substances formed would be removed in the process of solvent purification, that is, distillation which is a routine procedure in the maintenance of degreasers. This line of endeavor proved of little value.

Lime and soda ash were next tried the presence of moisture, which in itself was deleterious.

### Stabilization Theory

The final theory of incipiently absorbing any acidic products of decomposition by a substance capable of assimilating the hydrochloric acid radical in its entirety without the end products themselves being harmful, was tried. This proved to be the correct theory for stabilization.

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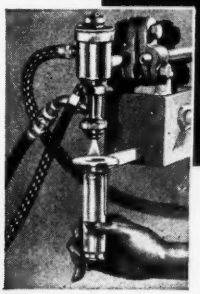

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reaction cover many fields, and experiments were legion. Among the groups tried were organic bases—all types and kinds. The solvent soluble bases gave the consistently best results when added directly to the solvent. It was then noted that the mother liquid would remain stable, but that the vapors were neutral when distilled. This condensate soon showed the same degree of cleavage as the original solvent. This was true to a varying degree on all chlorinated solvents under simulated metal degreasing trials.

The results of these experiments indicated the necessity in the metal degreasing field of having a stabilizer of the organic base type,[1] which would be soluble in the chlorinated solvent, would volatize with the solvent vapor during distillation, remain soluble in the vapor and condense with the vapor, thus rendering the condensate stable. This is successfully accomplished by using an organic base whose boiling point and vaporizing rate is such that the reaction of the chlorinated solvent is always basic regardless of the number of times the solvent undergoes distillation.

The degreaser is to all intent and purpose a termo-balanced, open still, wherein a heating means is placed at the bottom of the vessel. Application of heat allows the vapor to rise to a predetermined height. This vapor height is controlled by placing a cooling means within and attached to the open tank at a definite level below the open top. Thus, we have the vapor rising and the vapor condensing in the open vessel. By means of a trough or gutter, the liquid solvent is collected and the stream can be directed as desired.

The degreaser has an open top, as shown in Fig. 1, and the solvent vapor is always in contact with air. This air is constantly in motion and contains moisture which is transferred to the solvent vapors at the interfacial layer. This exchange actually is a source of introduction of moisture, which amount, in addition to that accumulated from the metal being cleaned in a commercial degreaser, at times may become considerable. Therefore, a water separator is supplied with most degreasers as shown in Fig. 2. It is this moisture which saturates the solvent vapor at the time of condensation that makes it necessary that the solvent vapors be slightly basic. At this condensation stage, in contact with metal and under the influence of daylight, the chlorinated solvents are very easily decomposed.

The same theory of stabilization is applicable to all types of chlorinated solvents, and gives considerable freedom in the kind of organic base used. Therefore, proper consideration may be given to the use for which the solvent is stabilized, namely, when chlorinated solvent is to be used for food extraction or the cleaning of clothes, the amount and kind of stabilizer may be varied to meet the exact requirement imposed by this specific application. This flexibility renders stabilization practical, easily controlled, and positive in action.

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[1] *The following U. S. Patent numbers cover the stabilization of chlorinated hydrocarbon solvents, and equipment for their use in industrial cleaning applications:* 1,771,698; 1,869,826; 1,869,845; 1,875,937; 1,907,875; 1,911,926; 1,938,-841; 1,942,355; 1,961,867; 1,984,364; 1,987,586; 2,016,376; 2,018,648; 2,020,335; 2,028,759; 2,036,-261; 2,101,840; 2,101,841; 2,107,369; 2,113,129; 2,116,862; 2,116,863; 2,137,479; 2,214,788; 2,223,-595; 2,273,939; RE-20,359.

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**Vulcalock Barrels and Drums.** A new catalog section on its line of barrels and drums lined with rubber by the Vulcalock process has been published by The B. F. Goodrich Company, Akron, Ohio. The barrels and drums are used for the safe, economical handling of corrosives. The catalog section describes the properties and limitations of the Vulcalock drums and barrels, with details of construction and uses. Copy free.

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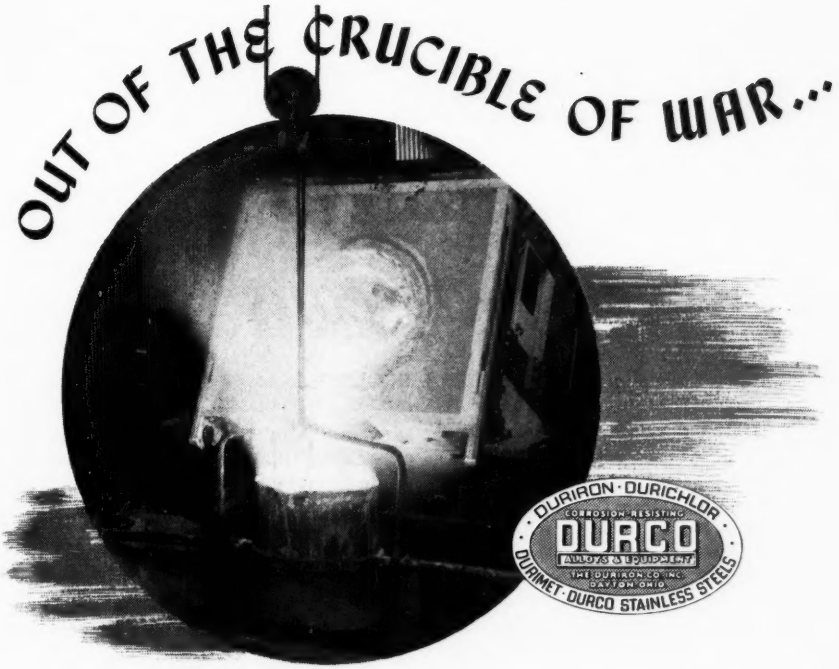


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# *By-Passing Priority Pitfalls of the Plater with the New Vitreous Silver*

By HAROLD J. KROESCHE

THE electro plating industry in the past ten years has made great strides in that it has advanced from a purely decorative art to an industry of profound importance. The advances made were dependent on the research and development of manufacturing companies using a plating process as well as manufacturers of chemicals and metals making up a particular process.

The resultant research and development made it possible to utilize many metals economically by means of electro deposition; hence the demand for metals increased many fold with the result that many products of commerce were plated. The principal metals used were nickel, chromium, cadmium, zinc and copper, in the approximate order outlined.

The developments as they were put into commercial use in large factories finally were offered to job platers who heretofore had done decorative plating primarily. This progress made it possible for the job plater to take advantage of new developments and do semi-commercial plating for small manufacturers not having sufficient production to establish their own plating plants.

With the march of progress the job plater was offered more commercial work and thus it became necessary for him to meet conditions by expanding his place of business by adding larger tanks and using the latest methods if he was to keep up with his fellow platers. The American Electroplaters Society and American Electrochemical Society kept him abreast of the times by publishing articles and research papers on new methods and improvements on old.

The principal advances were on nickel and chrome plating for the reason that the costs of producing nickel and chrome deposits with satisfactory thicknesses made this treatment of metal most attractive for corrosion resistance and decorative appeal. Cadmium and zinc plating had similar advances from a purely corrosion resistant standpoint, so they must also be considered in the commercial advance of electroplating.

At the time when electroplating was reaching an all time high our country felt it necessary to prepare for war as world conditions gave evidence that such would be the final outcome of the European conflict. Preparations for war involve all metals used for electroplating and many more. The metal first affected by our preparedness program was nickel, since it is used in large quantities in the steel industry for stain-

less steel armor plate, and other nickel alloys. The result of this increased demand for the defense industry made it advisable for the Government to allocate nickel for civilian use in 1941 to about 35 per cent of their 1940 consumption. This restriction, while it caused some hardship on platers, did not force them to stop the plating of nickel although it did curtail their efforts.

Our declaration of war and all out war production in December, 1941, made our Government take stock of all strategic metals and the result was that no nickel would be permitted for use in non-defense business after April 1, 1942. The use of other metals essential to defense, as cadmium and zinc, was affected earlier, due to their conservation for defense effort and principally since amounts available in normal times were about equal to demand.

The placing of metals necessary for war effort under allocation and in many instances permitting their use only on defense projects made manufacturers, suppliers and platers look toward some means of substitution that might permit them to continue to serve civilian needs. During this search for substitutes many platers devoted their entire effort to defense industry, thus obtaining metal for use by priority system of allocation. Many platers and manufacturers could not readily change to defense needs and so were at a loss as to which way to turn in order to take care of at least a portion of their business and hold it together for the duration of the war.

One prominent manufacturing company, producing plating chemicals and metals, foresaw conditions early in 1941 and set its research department to work with the hope that an investigation would result in finding a reasonable substitute that


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might be applicable to as many industries as possible, using raw materials that did not require priority ratings to obtain.

The research group studying the situation thoroughly and investigating all possibilities arrived at the conclusion that the only available metals suitable for the purpose would be silver or gold, silver being preferred because of its lower cost, availability, efficiency and the varied type of deposit obtainable with variation of bath conditions.

Further investigation revealed that articles manufactured from steel would prove more readily obtainable because of general higher production facilities.

A research program was then instigated for the purpose of determining the best solution and conditions of operation to give the most satisfactory deposit of silver on steel at minimum cost.

The remaining problems that confronted the research department were how to protect the silver deposit from tarnishing and how to make it resistant to fairly severe handling. Lacquering the finish was one solution to the problem but lacquered finishes do not stand severe abrasion, nor will they stand any great degree of heat. Lacquered finishes being made from Nitro cellulose plus certain synthetic resins, both of which are on the strategic list, eliminated them. The idea then came: Why not apply a glass surface similar to that used on jewelry? This idea was tried and found to show some promise.

With the establishment of silver plate with ceramic jewelry enamel as the finish coat, the problem now was to produce an enamel which would adhere properly, have scratch resistance, and stand as much strain and heat shock as possible. The problem was presented to a ceramist for solution and in a short time he came forth with a glass having most of the desired characteristics wanted by plating chemists.

The plating chemist then prepared some silver finishes to start with, from the many well known silver plating baths, and applied the glass and fired the pieces under conditions outlined by the ceramist. These test pieces on examination proved that the normal silver plating bath did not give desired type of deposit for the best adhesion of glass.

From the ceramist's past experience he advised the plating chemist that in order to make glass adhere properly the base deposit must be of granular nature, in other words almost crystalline, thus giving tooth or a surface rough in composition for the glass to have proper adherence.

This need of producing a rough surface induced the plating chemist to try various types of plating baths and all the available formulas for silver plating. The result was the selection of the Woods type of bath.

The reason for selection of Woods type of silver bath was that this more economical solution would allow higher current densities, better throwing power, and gave the granular deposit under proper current densities.

Sufficient adherence is not obtained by plating silver directly on steel, hence a strike bath is required before application of silver.

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The following formulas cover the strike and silver plating solutions utilized with conditions of operation.

### Strike Formula

Silver Nitrate...0.15-0.30 oz. per gal.
Sodium Cyanide....10-20 oz. per gal.
Potassium Nitrate..0-10 oz. per gal.

### Silver Plating Solution

Silver Nitrate.....4 oz. per gal.
Sodium Cyanide.....4½ oz. per gal.
Potassium Nitrate....16 oz. per gal.

### Plating Cycle for Steel

1. Clean as anode one to three minutes.
2. Rinse.
3. Acid dip in 5-20 per cent muriatic.
4. Rinse.
5. Silver Strike 10-25 amp. sq. ft. 1-3 minutes.
6. Transfer direct to silver plating bath and plate at 3-6 amp. per square foot — temperature 80-85 F. about 20 minutes.
7. Rinse in strike solution.
8. Rinse in cold water.
9. Rinse in hot water and dry.
10. Parts are ready for application of enamel.

To the plated articles then is applied from a water solution by spray gun the jewelry enamel at the rate of 40 to 50 grams per square foot, and enamel fired at 1450 to 1500 deg. F. for 5 minutes. Articles are then removed and ready for assembling.

The resultant finish has a lustrous appearance and makes a very attractive finish as samples on display show. The finish lends itself to varied color effects and decorative possibilities; also has utility in certain lines of manufacture.

The finish has exceptional resistance to heat, water, mild alkalis and acid and may be used very satisfactorily on simple surfaces that are


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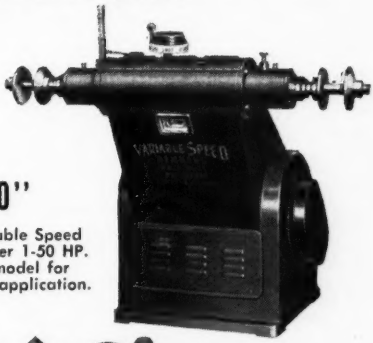


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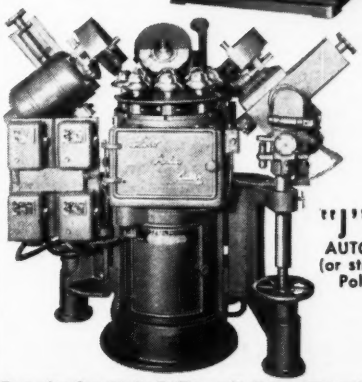

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not subject to bending strains. Its use, perhaps, will be limited to de-luxe finishes where good sheen is desired.

It is realized that this process does not have as wide an application as nickel and chrome, but in a limited way should go far in allowing manufacturer to still produce certain articles of commerce for civilian use.

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**Colt Autosan Metal Parts Cleaning Equipment.** A 12-page catalog which contains photographs and drawings of Colt Autosan metal parts cleaning equipment is now being issued by Colt's Patent Fire Arms Mfg. Company, 1933 Van Dyke Ave., Hartford, Conn. Colt Autosan Metal Parts Machines can be furnished to handle the many and varied washing, rinsing and drying requirements incidental to product manufacture. These machines range in size from small, compact, single-purpose units to large, powerful multi-purpose machines and handle work from small parts to large castings. Throughout the Colt Autosan line, regardless of the size or type of machine, correct design as well as quality of material and workmanship are combined to produce an effective machine. Special Colt Autosan equipment can often be designed to meet more exacting and specialized cleaning needs.

Standard Colt Autosan Conveyor Machines are available for handling various types of work. Flexibility of design of these machines makes it possible to select a standard unit which will, in most cases, handle normal cleaning requirements. Several types of conveyor are available which permit handling of work either directly on the conveyor or in suitable racks or trays. Machines can be arranged for heating either by steam or by gas. One particular feature of the Colt Autosan conveyor type machine is the outside tank which permits the cleaning and inspecting of the tank with a minimum of difficulty. The conveyor models can be supplied in the "MR" type for the handling of normal requirements or in the "MV" type for more difficult needs.

Outstanding in the field of cleaning and drying of bulk material are the Colt Autosan Revolving Type Models. Machines of this type handle small parts in a most effective manner through practically any series of operations which may be encountered in the process of cleaning. Parts such as screws, nuts, rivets, buttons, small arms ammunition parts and thousands of other items can be cleaned in this manner. Embodied in these machines, as in the case of conveyor models, are refinements of design which contribute greatly to long life and low upkeep. These types can be obtained for drying only; for washing, rinsing and drying; for washing, rinsing, lubricating and drying (this type being particularly efficient where subsequent drawing operations are used) or for pickling of work following furnace annealing. The latter operation can be performed in combination with practically any series of washing and drying operations which the processing requirements may call for.

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**Schauer Speed Lathe Catalog.** An attractive, 24-page, 8½ x 11-inch catalog designed to provide readers with a quick apprehension of vital information relative to its Ideal line of speed lathes has been published by the Schauer Machine Co., 2060 Reading Rd., Cincinnati, Ohio. The line includes chuck type lathes, hand-operated collet type lathes, foot-operated collet, motor and brake type lathes, wheel chuck lathes, foot-operated magnetic clutch and brake control type lathes, bench and pedestal variable speed lathes, powerful infinitely variable spindle speed lathes, and speed lathes with vacuum type holding fixtures. Special applications for many different finishing, polishing, lapping, and burring operations are illustrated in the catalog. Copy free.

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In addition, plated finishes are making important contributions to the production and processing of many essential products. Take chromium plating for example. There are many applications where this process saves vital materials and man-hours in the fabrication of metals. We have prepared a helpful booklet on this subject entitled "The Last Thousandth of an Inch that Speeds Production" which points the way to further possibilities for chromium plating in war industries. A copy is yours for the asking.

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THE PLATING PLANT has an important role in the war effort . . . in meeting the needs of our military departments, in utilizing available electroplating facilities, in getting the most out of materials and equipment.

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***SPEED CONVERSION!*** U. C. supervisory assistance helps licensees to get their installations into prompt and efficient war production.

***MEET SPECIFICATIONS!*** In serving hundreds of licensees, we have had wide experience in the operating cycles, solution control and plating techniques required for work to strict standards.

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# *Gas Guards War Production*

## *Compressed Carbon Dioxide Reduces Fire Risk in Metal Finishing Industries*

By BARTLETT WEST

THE annual average fire loss in the United States during the last ten years has been $284,000,000, according to the National Fire Protection Association. In time of peace such a destruction of property assumes serious proportions. In time of war it represents a situation that must be remedied, not only to conserve materials, but even more important, to conserve valuable production hours which once lost can never be replaced. Today it is the patriotic duty of every industrialist to see that his factory has the best possible fire protection.

One of the most important steps in assuring adequate fire protection is the selection of the right type of equipment for the particular hazards existing in each individual plant. Fire engineers break down hazards into three groups. The first or "A" group includes fire occurring in wood, paper, rubbish, and so on. For such blazes water is the best extinguishing agent except in special cases, such as storage vaults, where the water itself would do as much damage as the actual flames.

Class "B" and "C" fires, which

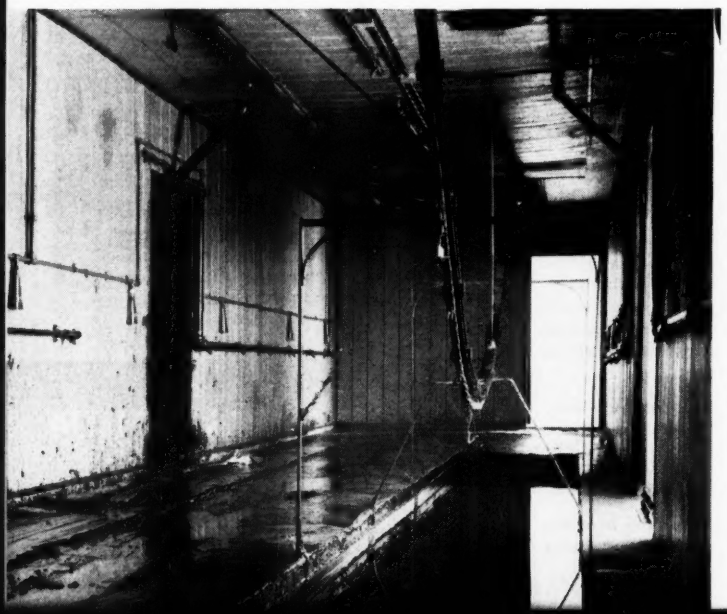

Fig. 1 — A general view of the conveyor dip room at the James L. McInerney Spring & Wire Co. In the foreground are the 4,500 gallon diptank and the splash floor. Shielded nozzles through which carbon dioxide is discharged at the first sign of fire can be seen along both sidewalls.

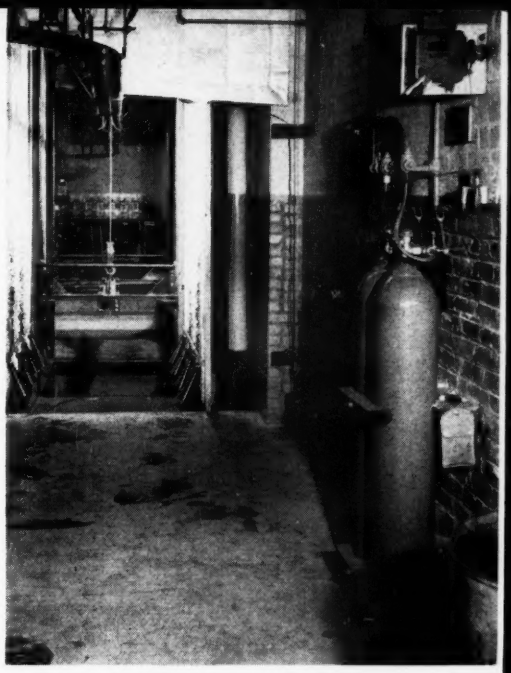

Fig. 2—The smaller 1,000 gallon, hand-fed dip-tank at the McInerney plant. In the right foreground is the two-cylinder carbon dioxide system from which gas will be discharged through the shielded nozzles along the sides of the tank the moment a fire breaks out.

•

are responsible for a large part of the industrial fire loss, present a more difficult problem. Class "B" fires are those which occur in electrical equipment, and they must be fought with a medium that will not conduct an electrical charge that might injure the operator or short circuit the wiring, and that also will not dissolve insulation. Class "C" fires—those involving flammable liquids—are the most vicious blazes of all because of their easy ignition and sudden violence. Such blazes must be smothered without the use of a liquid stream which might spread the flames.

After many years of research, safety engineers discovered that an ideal extinguishing agent for these latter two types of blazes was carbon dioxide gas—the same inert vapor which is used to put the fizz in soda water, and which, in solid form, is known as dry ice. Not only is this gas effective in putting out fires, but it is highly compressible, permitting easy storage, and it is non-toxic and non-injurious to materials, thus eliminating the factor of damage from the extinguishing agent.

Carbon dioxide acts against fire by reducing the oxygen content of the surrounding atmosphere to a point where it will no longer support combustion. Normal air contains 21 per cent oxygen. When this is reduced to 14 or 15 per cent through dilution with carbon dioxide, the fire is figuratively "strangled."

There are three general types of carbon dioxide extinguishing equipment—portable, fixed "local application," and fixed "total flooding." Portable equipment ranges from two-pound capacity, pistol-grip hand models up to the two thousand-pound capacity motor driven crash trucks used to protect military and commercial air bases. In between is a wide variety of hand, wheeled and trailer models. Portable equipment is designed for first-aid fire-fighting on almost anything from telephone switchboards to airplane motor test blocks. Its importance can be seen from the fact that last year nearly 70 per cent of all industrial fires were put out by first-aid fire-fighting.

The two kinds of fixed equipment—local application and total flooding—are basically similar, the essential difference being that local application installations are designed to guard a concentrated hazard such as a dip tank, drain boards or individual machine; while a total flooding system will protect an entire space such as a spray booth, baking oven, dust collector or store room. Such systems consist of one or more steel

Fig. 3—The entrance, left, and the exit, right, to the McInerney diptank room. To the right of each opening are special screening nozzles which, in case of fire, cut-off outside oxygen, and prevent the flames from spreading with a blanket of carbon dioxide. Regular shielded discharge nozzles can be seen to the right and left of the conveyor exit.

cylinders of carbon dioxide, compressed under a pressure of 850 lbs. per square inch, located at a distance from the hazard; a release valve which can be either operated manually or by a heat-actuated automatic detector, a system of steel pipe leading to the hazard, and shielded nozzles through which the released gas is discharged.

In local application installations, these nozzles are placed so as to direct the gas at the point where the fire is expected to break out. With the total flooding system, the nozzles are spaced about the room at a point two-thirds of the way from the floor to the ceiling, and, in case of fire, the entire room is flooded with inert gas in a matter of seconds. Accessory devices are available whereby it is possible to have the released gas sound alarms, close firedoors and windows, shut off electric motors and fans, and otherwise isolate the blaze. Where there are no firedoors, as in the sumps connecting motor test cells, special screening nozzles may be installed which will blanket the opening with gas, cutting off the outside air and preventing the blaze from spreading.

With the total flooding system, it is extremely important to have a sufficient quantity of gas to supply adequate protection. In the average process room, this can be determined from the following table set up by the National Board of Fire Underwriters:

| | |
|---|---|
| Up to 1,600 cu. ft. of space | 16 cu. ft. per lb. of gas |
| Up to 4,500 cu. ft. of space | 18 cu. ft. per lb. of gas |
| Up to 50,000 cu. ft. of space | 20 cu. ft. per lb. of gas |
| Over 50,000 cu. ft. of space | 22 cu. ft. per lb. of gas |

The need for carbon dioxide fire protection is not confined to the paint, petroleum and chemical industries, and the big power plants. Today almost every war industry has some electrical or flammable liquid hazard, and for complete fire protection, this hazard, no matter how small, must

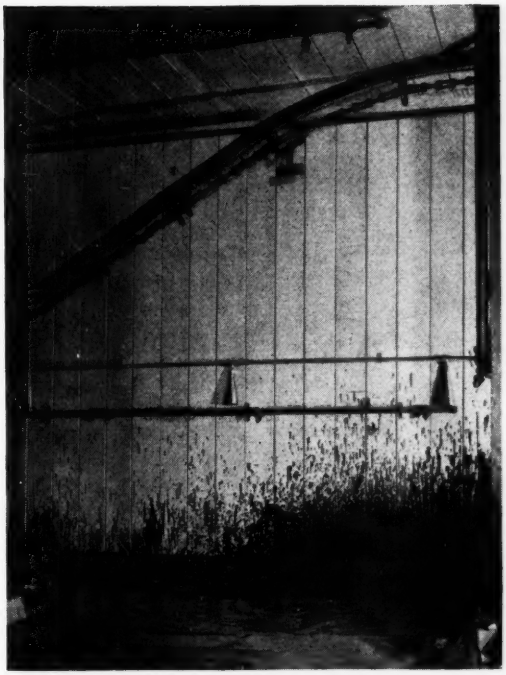

Fig. 4—Looking into the tank room from the conveyor exit. At the center are shielded nozzles which stand guard over the tank. At left are special screening nozzles ready to blanket the conveyor entrance with a fireproof curtain of carbon dioxide.

be guarded with a suitable agent. In many cases, portable equipment will suffice, but in many others fixed installations are required.

One installation that is now standing guard over a defense plant is that at the McInerney Spring & Wire Company in Grand Rapids, Michigan. Prior to the war, this factory turned out cushion springs for pleasure cars. Today, it is making many types of springs and other metal parts for the armed forces. The finishing process for nearly all these assemblies consists of dipping in a 4-500-gallon paint tank and passage via a conveyor belt into a large drying oven.

In 1939, the old McInerney plant burned to the ground, causing a loss estimated at nearly a million dollars and throwing 1,100 employees out of work. The fire started when a workman opened the door to a paint drying oven. Flame licked out and ignited a spring assembly on an overhead conveyor. In a few seconds, the blaze spread back up the conveyor belt to the giant dip tank. Equipment then in use impeded the fire only momentarily, and in a short time, the entire factory was ablaze.

Every precaution has been taken to prevent a repetition of this disaster—in the new McInerney factory. Today, the dip tank is protected by an eight-cylinder carbon dioxide system with twenty nozzles ready to flood the entire enclosure with fire-smothering gas at the first sign of a blaze. Screening nozzles at the conveyor entrance and exit preclude the entrance of flame, and monthly tests over a period of two years have shown positive action in every case. A smaller two-cylinder installation with sixteen discharge nozzles stands guard over a smaller 1,000-gallon tank nearby.

Of particular interest at the pres-


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The turbine blades, precision-made of stainless steel, require thorough, careful removal of heavy sulfonated oil before assembly. Blades and other parts, in this instance, were being cleaned by soaking in a boiling solution of trisodium phosphate (24 oz./gal.) and soda ash (4 oz./gal.), then hot rinsed and dried.

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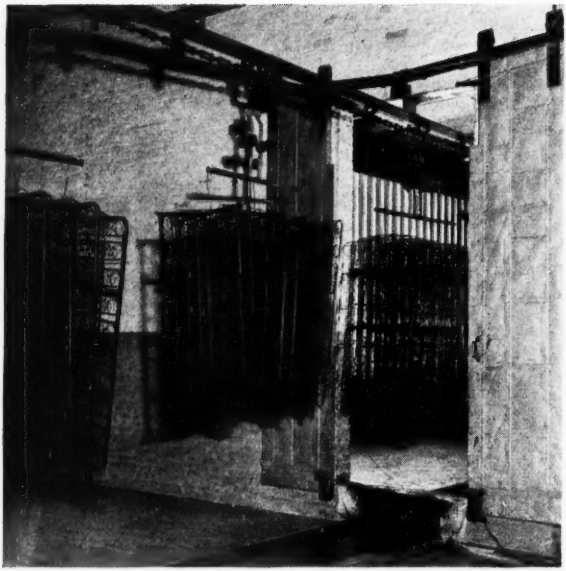

Fig. 5—Danger spot of the McInerney plant. This is the drip line where newly dipped cushion springs head for the drying ovens. A flash from the oven could travel right up this line to the dip-tank but for the carbon dioxide system guarding tank entrance and exit.

ent time is the fact that this built-in carbon dioxide system not only offers complete protection against normal hazards, but in addition, safeguards these two highly flammable points against the menace of magnesium incendiary bombs. Recent tests conducted on incendiaries have proved that total flooding carbon dioxide systems offer the same amount of protection to surrounding combustibles as a water stream, and speed up the burning of the magnesium by one-third as compared to water's eighty per cent speed up. What's more, carbon dioxide will not, in itself, damage or contaminate paint and other materials. It should be pointed out, however, that portable carbon dioxide equipment is not suitable for fighting magnesium incendiaries — total flooding installations must be used for this purpose.

**The Cleaning of Industrial Floors.** The Magnus Chemical Company, Inc., 208 South Ave., Garwood, N. J., manufacturers of industrial cleaning materials, emulsifying agents and metal working lubricants, has issued a 24-page technical bulletin entitled "The Cleaning of Industrial Floors."

This bulletin, No. 62, has been written not only from the viewpoint of cleaning floors for personnel safety by the elimination of greasy, slippery floors, but from that of cleaning floors for longer floor life. It provides the one in charge of floor maintenance with a guide to the selection of the proper type of cleaning material best suited to his floors.

The bulletin covers the cleaning of practically every type of flooring material used in all types of building and industrial plants. Among the types of floors discussed are: concrete, wood, painted or varnished, linoleum, cork tile, rubber and terrazzo. Some of the other subjects covered are: Why Clean Floors?, The General Problem of Floor Cleaning, What Does a Floor Cleaner Have to Do?, Suspension of Dirt, and Rinsing.

Copy of Bulletin No. 62 will be sent free upon request.

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**U. S. Government Specification Finishes.** A booklet on U. S. Government specification finishes has been published by Maas & Waldstein Company, maker of industrial finishes, 438 Riverside Ave., Newark, N. J. The booklet provides makers of armament products with essential information on M & W finishes that have been made to conform with various U. S. Government specifications. Copies will be sent on request to engineers, purchasing agents, and others requiring this information.

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# *Rust Protection Studied*

TO find out how oxygen combines with metals, and how fast, Dr. Earl A. Gulbransen, of the Westinghouse Research Laboratories, Pittsburgh, Pa., is weighing oxide films, or rust, with a tiny weighing machine so sensitive it measures its loads in weight units of ten billionths (10/1,000,000,000) of an ounce. Each year rust, tarnish and corrosion cause an estimated 200 millions dollars damage to bridges, steel building and machine parts. Through this research, Dr. Gulbransen is seeking new ways to protect steel and other metals against the destructive action of oxygen in the air.

### Balance Detects Single Layer of Atoms

The special weighing machine devised for this study is shown in Fig.

Fig. 1—With a microscope, Dr. Earl A. Gulbransen, Westinghouse research chemist, reads the weight of oxygen atoms that tarnish steel and other metals. A white glass weighing instrument inside the tube, left, measures in weight units of ten billionths of an ounce a single layer of atoms on a piece of steel half the size of a razor blade. A see-saw weighing beam is suspended on an invisible strand of tungsten wire.

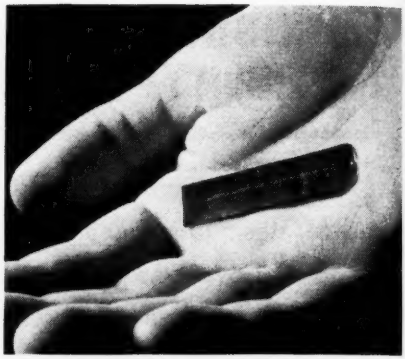

Fig. 2—A weighing instrument, or balance, can measure the weight of a single layer of atoms —about 15 billionths of an ounce—on this tiny piece of steel. In the form of rust or tarnish, this layer of atoms is only amout 10 billionths of an inch thick, and is invisible. It would take 65,000 such layers to equal the thickness of a sheet of tissue paper.

1. It is sealed in a glass tube to take measurements on a piece of metal, as shown in Fig. 2, which is half the size of a razor blade. Movements of the balance's pointer, so minute they can be observed only through a microscope, reveal the weight added to a tiny sample of steel by a single layer of oxygen atoms. One layer of atoms is about 10 billionths of an inch thick. There are enough atoms in a thimbleful of oxygen to form more than 65,000 such layers on the steel sample.

The balance, about six inches long and an inch

inch square, is enclosed in one arm of a glass tube the shape of a cross, three feet tall and two feet wide. The moving arm of the balance is a piece of quartz six inches long and one-sixteenth of an inch in diameter. It is supported in the middle like a see-saw by a fine piece of tungsten wire which is stretched across a framework made of quartz. Quartz is used because it has less expansion than other substances when heated.

From one end of the moving beam the sample piece of steel is suspended on a two-foot piece of tungsten wire inside the vertical part of the glass tube. A counterweight, with the same weight as the sample, is hung on the other end of the beam.

### Steel Cleaned with Hydrogen

The sample is polished and washed three times in alcohol before it is placed in the tube, but the brief contact with air is enough to form several layers of oxide. The tube is sealed and the air is removed by two vacuum pumps. Final cleaning is done with hydrogen. A small amount of the gas is piped into the tube from a pressure tank. The hydrogen combines with the oxygen on the surface of the sample to form free water vapor, which is then pumped out of the tube.

To start the experiment, a small amount of oxygen is admitted to the tube from another tank. The sample gets heavier, as the oxygen combines with the surface layers of the steel, swiftly at first and then slowly. Movement of the balance beam is watched through the microscope, and the changes in weight are recorded every few minutes.

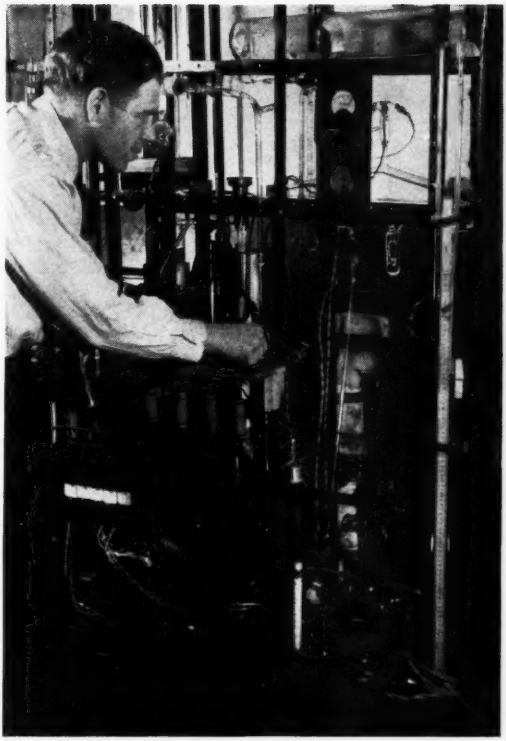

Fig. 3—Tubes, valves, and meters shown here are used to control vacuum pumps and gas tanks connected to the glass tube which contains the weighing instrument.


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# Modern Gold Plating — Part 23

By JOSEPH B. KUSHNER, CH.E.
Metal Finishing Consultant
New York City

A GREAT DEAL of attention is being focused on the subject of dragout these days, in connection with our national campaign for saving, reclaiming and economizing in the use of vital metals and materials. Contemporary and past papers on dragout have shown that a considerable amount of loss can occur through this agency, of both metals and chemical compounds, so urgently needed today. As a result, many plating plants are adopting measures for reducing and reclaiming dragout lossses that they never would have adopted two years ago. In 1935 (we are proud to be one of the pioneer writers on the subject), our analysis of the dragout losses that could occur in plating,* was thought to be important insofar as gold and other precious metal plating was concerned but unimportant when it came to plating with other metals. In those days as always before, we had metal and chemicals to burn and the small losses incurred through dragout seemed trivial. Now as the shoe gets tighter and the well is running dry, we are beginning to realize the error of our profligate ways and are trying to nurse every ounce of metal along so that we can produce with a minimum of waste.

This rather long-winded introduction is intended to show that little things can be important in plating, just as they are important in any other field of endeavor. Now there is another little thing, intimately related to dragout, just as important—and probably more so, that has not as yet been given the consideration it merits. That little thing is—drag-in — the cause of more plating ills than we'll ever know about.

What is drag-in? Drag-in is the opposite or inverse of dragout. Drag-in is the droplets of water that are carried into the plating tank, on the work, from the water rinses and dips. Since most drag-in is ordinary aqua, commonplace water from the tap, no attention is paid to it, yet these droplets of water that are carried into the plating bath can be the cause of many plating troubles. Why? Because the ordinary water that is used in plating rooms is not pure. It may taste good for drinking, it may be fine for washing but as far as plating goes, it's alive with trouble.

Common tap water always contains dissolved salts and suspended matter.

*Losses from Recovery Rinse Tanks; Metal Industry, January 1935.

These impurities cannot be avoided in tap water inasmuch as it is in contact with many substances before it reaches the plating room. Since water is in the nature of being a universal solvent, it is bound to dissolve and (or) suspend a small quantity of unwanted materials before it gets to the scene of plating operations, and after.

Frequently found in tap water are the following ions: calcium, copper, hydrogen, magnesium, sodium, iron, manganese, bicarbonates, carbonates, sulphates and chlorides. Other ions less common, gases such as $H_2S$, $CO_2$ and $SO_2$, even organic acid ions, can be found in natural water, depending on the locality of the water source.

Waters are generally classified as hard or soft. Those waters that contain calcium and magnesium in sufficient quantity to render soap lathering difficult are called hard waters; others, that contain insufficient to cause this difficulty are called soft waters. The hardness of a given water may be further subdivided into temporary or permanent hardness. If magnesium and calcium are present in water in self precipitating form, for example, as the bicarbonates, the water is called water of temporary hardness because the simple act of boiling precipitates the offenders out of solution, thus

(1) $Ca(HCO_3)_2 \rightarrow CaCO_3 \downarrow + H_2O + CO_2 \uparrow$

If calcium and magnesium are present as chlorides or sulphates, the magnesium and calcium cannot be precipitated by boiling and this water is called water of permanent hardness. Water of this class must be given special treatment with zeolites and (or) soda ash before it can be rendered soft.

The amounts of a given ion present in a specimen of water are recorded either in parts per million (equiva-


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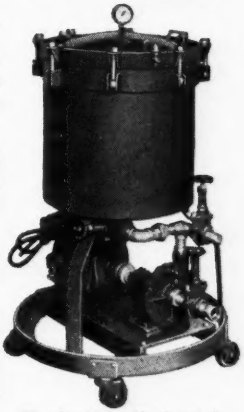

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lent to milligrams per liter) or grains per gallon, since the quantities present are so small that giving the concentrations in ounces per gallon or grams per liter would introduce a large number of zeros. The total hardness of a water is considered to be the sum of the permanent and the temporary hardness. In the U. S. the average hardness of natural waters varies from 0 to about 500 parts per million. There is a great deal more to water and water softening, enough to fill several volumes, but we are interested only in the effect of water in the plating room, so we'll go no further.

The quantities of suspended matter and the ions dissolved in water are obviously very small, yet they can have, because of drag-in, highly undesirable effects in the plating plant, and can be the cause for a considerable amount of waste in time and materials as well as labor. This statement can be put into more concrete form by giving an actual case history where contamination by drag-in played hob with a gold plating room. In the particular plant under consideration, white metal costume jewelry was given a plate of bright nickel in a 100-gallon tank, it was then rinsed in a 5-gallon running rinse, given a gold flash in a 5-gallon gold plating tank, given a running cold water rinse, a hot water dip and dried in an air blast drier.

It was noted that after a period of two weeks of operation a new gold bath gave pale deposits despite the fact there was plenty of gold in it. At this stage, since nothing in the way of additions seemed to help, the tank was invariably dumped and reclaimed and a new bath set up. This happened like clockwork and was beginning to get the proprietor down, so we were called in for a little detective work. The obvious and correct answer to the problem was drag-in contamination due to faulty rinsing after the nickel plating bath. The nickel solution, highly concentrated and viscous was being carried into the gold bath because of poor rinsing. In the gold bath nickel ions would build up until they reached a concentration where they would start precipitating with the gold, causing the unwanted pale color.

In this same shop prior to drying, work was dipped into a 5-gallon hot water pot heated over a direct flame. From time to time the water that had evaporated off was replenished from the tap. The plater informed us that he could not use the blast drier because every time he did so, the work came out with a film, or spots on it. Here again contamination by drag-in was the root of the evil. The policy of adding water to the hot water tank for that boiled out was permitting certain salts to build up in highly concentrated form, and as a result, when the water dried in the air blast, a coating or film of these salts would form on the work, spotting and staining it.

A third trouble that could be laid to drag-in was in the bright nickel bath itself. The nickel bath would work right for a period of two weeks then presto! a faint cloud would appear on the work. At first, it was so faint as to be tolerable, but a day later operations had to be halted in order to purify the nickel bath by dummying, and activated carbon filtration. Could it be that a harmful


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ion was being dragged in and concentrated in the plating tank to reach a point where it caused this mischief? It was.

This example of drag-in contamination in one plating shop, could be duplicated in hundreds of cases all over the country. G. B. Hogaboom in his paper on "Water in the Plating Room"* gives several of them. It is known that certain ions such as magnesium, calcium, copper, iron and manganese just to mention a few, cannot be tolerated in a number of bright nickel baths because of their harmful effects. Similarly, small amounts of these ions can affect other types of plating baths, causing poor deposits by affecting polarization, conductivity, neutralization, precipitation and pH. The fact that only very small amounts of ions will produce large effects in this connection is proven to the practical plater day after day when he notices that small excesses of brightening agents raise havoc with the plate. In silver plating, for example, .001 oz. per gallon of carbon disulphide is sufficient to brighten the plate; a tiny fraction more and the plate gets hard and discolored.

Before we go into our analysis of drag-in let us check over some of these ions and the effects they can have on plating.

### Calcium and Magnesium

1. Calcium and magnesium react with soluble soaps to form gummy, sticky, insoluble soaps that are extremely difficult to remove. Work rinsed in hard water, then dipped into an ordinary soap solution( such as in soap burnishing) may, therefore, precipitate on itself some of this gummy material.

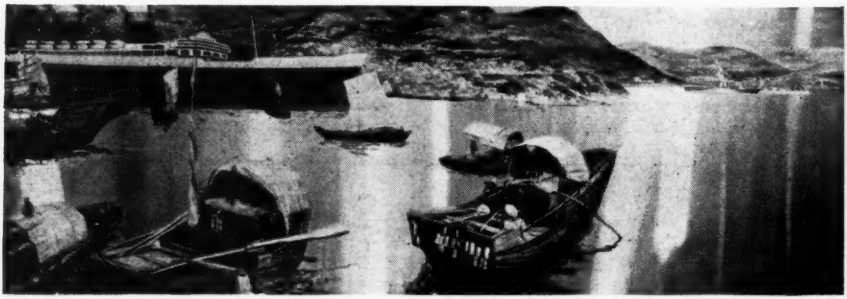
(2) $2C_{17}H_{35}COONa + MgCl_2 \Longrightarrow$
Sodium soap—soluble
$Mg(C_{17}H_{35}COO)_2 + 2NaCl$
Magnesium soap—insoluble ↓

2. When a concentration of these salts is built up in a rinse tank, they may coat the work and stain it on drying, and, their hydrolysis tends to induce corrosion.

(3) $MgCl_2 + HOH = MgO + 2HCl$

3. Magnesium and calcium precipitate as carbonates in cyanide baths and float around, tending to migrate

* *Water in the Plating Room, Metal Finishing, April 1939. Well worth any plater's reading.*



This mural for the United States Naval Academy at Annapolis was dedicated recently by Admiral Ben Morrell. The painting is unusual in that it is done on a highly polished Armco Stainless Steel sheet, 6 by 18 ft., instead of canvas. It is the work of the distinguished artist, Buell Mullen, Lake Forest, Illinois. The theme of the mural is a harbor scene of Hong Kong.

to the cathode, causing porosity and pits.

### Iron and Manganese

1. Iron and manganese tend to hydrolyze and oxidize to insoluble forms producing dark stains and rust. If iron builds up in a gold plating tank the gold deposit will gradually take on a purplish off-color hue. Iron and manganese are poison in bright nickel baths, produce plate ridges in acid copper baths and make cyanide copper deposits difficult to buff.

### Hydrogen

When water is chlorinated for health purposes, a certain amount of hydrogen ions are liberated. These increase the acidity of the water and on occasion the pH of the water may go as low as 5, particularly where organic acids are present. If the pH of a water goes below 7 it is on the acid side and may cause the following:

1. The hydrogen ions will destroy cyanide in the plating bath.
2. They will cause the pH of a plating solution to fluctuate erratically.
3. They will react with soaps to form fatty acids that are the devil itself to blast off a clean surface.
4. They will react with certain classes of wetting agents, precipitating them in non-active form, thus increasing the surface tension of the solution and permitting a film to form on the work.

### Bicarbonates and Carbonates

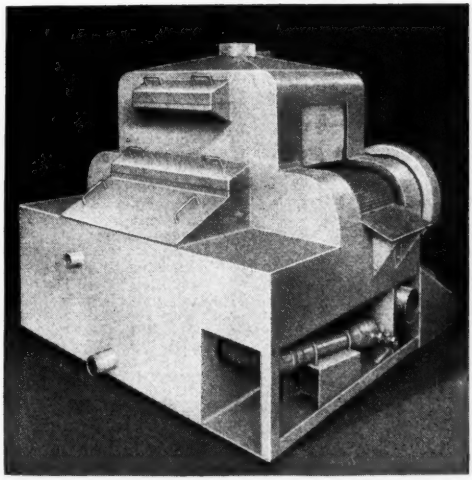
1. Bicarbonates will destroy cyanide in cyanide plating baths by reacting with it as follows:

(4) $Ca(HCO_3)_2 + 2\ KCN \longrightarrow$

$Ca\,CO_3 + 2\ HCN\uparrow + K_2\,CO_3$

(Lost cyanide; ← Carbonates →)


# *Have you an inter-process Cleaning Problem?*



**This Ransohoff conveyor type, gas-fired washing machine meets a specific need — efficiently.**
**Fits into the production line for inter-process cleaning of metal parts and products.**
**Speed up production, reduce costs and get a better cleaning job with Ransohoff Equipment.**
**Phone or wire Dept. P.F. for a Ransohoff Representative. He will make recommendations to solve your particular metal cleaning problems.**

**N. RANSOHOFF, Inc.**
***METAL CLEANING SPECIALISTS***
**Township and Big Four R. R.**
**CINCINNATI • OHIO**

2. In conjunction with the carbonates, they tend to increase the carbonate concentration of the bath at a rapid rate. Eventually some of these carbonates precipitate, causing difficulties mentioned previously.

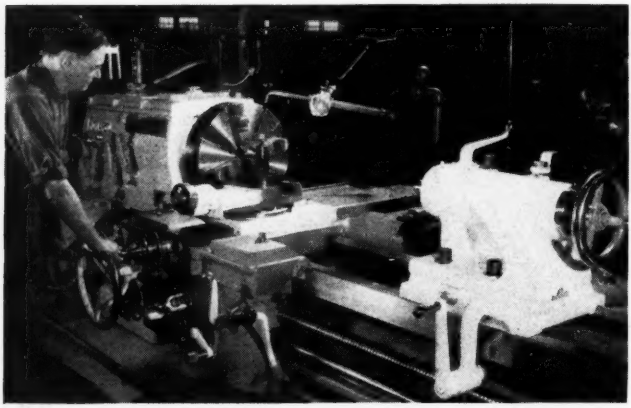
**Chloride**

1. Chloride ions may have an adverse effect in a number of plating baths. They can cause polarization in a zinc cyanide bath, for example, with a consequent reduction of efficiency. They will attack otherwise insoluble anodes, such as stainless steel in a gold plating bath, corroding them and bringing into solution sufficient iron to produce harmful effects.

This short list gives some idea of the dangers that lurk in drag-in contamination by tap water. Hogaboom in his most excellent study* gives as his closing thought "The big unsolved problem of the plating room is WATER." As we see it, the problem is not so much the water but knowing what happens when we put it into and drag it into our plating tanks. A plating plant can always have its water supply analyzed and there are on the market today several methods for softening water and reducing its hardness to almost zero; in fact, a recent method devised is almost good enough to take ocean salt water and convert it to drinking water without distillation. Where a water is very bad, even a distillation system can be set up, but the question is: Will it pay?

A particular ion or sediment may be present in a water supply and will gradually build up in a plating tank to a point where time must be taken out to purify the solution of the contaminant. The manufacturer will have to make a considerable outlay for a water softening system to get rid of the ion at the source, whereas it might be considerable cheaper to know at what rate the ion builds up in the tank and to take a certain part of non-producing time every week, let us say, for purifying the solution, before the concentration builds up to the danger point and catches him flatfooted with a lot of rejects on his hands. The question, then, in our minds, is not so much what particular ion is in the water, but how does it build up and at what rate? The answer to these two would go a long way in helping solve many plating problems connected with con-

** See previous foot note.*



Less eye fatigue due to long hours at defense work and incentive to keep the machine clean have resulted from painting parts of this lathe with ivory enamel at the Westinghouse East Pittsburgh works.

tamination by drag-in.

The subject of drag-in contamination has come up quite frequently in our work of late and we, therefore, decided to tackle a mathematical analysis of it. While we do not claim any originality in this connection, as far as we know, this is the first time such an analysis has appeared in plating literature. Those of you who do not care for heavy stuff can skip the first section of Part 24 which will be published in the August issue of PRODUCTS FINISHING and examine the final result and the practical applications that can be made of it.

Mr. Joseph B. Kushner, Ch.E., Metal Finishing Consultant, 233 W. 26th St., New York City, is in no way connected with or related to Mr. Kushner of Kushner & Pines, Inc., Gold Refiners of 21 W. 46th St., New York City.

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Be a Ten-Percenter. Now is the time to contribute ten per cent of your income for War Savings Bonds and Stamps.

**Heils Process Equipment.** One of the most complete catalogs of information on process equipment construction wtih chemical resistant materials is now being issued by Heil & Company, 12903 Elmwood Ave., Cleveland, Ohio.

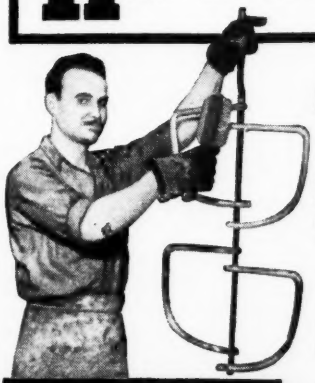
Included in this catalog is information under the headings: Tank Linings; Acid Proof Compounds and Paints; and Tank Heating Units. Under the heading of Tank Linings, information regarding fabricated chemical equipment, lead fabrication, brick lined tanks, and syphons for tanks is given.

Under the heading of Acid Proof Compounds and Paints, the following products are covered: Plast-O-Line (thermoplastic) tank lining, Carbalt plastic (cold applied) (also for caulking), Oxid-On rust sealer liquid, Alkalon alkali and acid proof liquid coating, Kem-Cote impervious liquid coating, and No. 77 acid-proof cement.

Under the heading of Tank Heating Units, the following subjects are covered: Steam jets—A-5 type for pickle tanks, Nocorodal tank heaters for muriatic and stainless pickle, coils for heating, and gas immersion heaters.

A copy of this catalog will be sent free upon request.


**How Metso Cleaners prevent waste**



**CONSERVE TIME**

Platers particularly appreciate how Metso Cleaners help to stretch production time. Metso cuts through dirt, grease and oil on metal surfaces so as to leave them chemically clean. There's no lost time in rewashing caused by incomplete cleaning performance.

Metal parts are quickly ready for further processing or plating. Proper method and quantities to use for your cleaning operation are important, and cheerfully furnished. Free descriptive bulletins on request.

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ECONOMICAL BASIC SOLUBLE SILICATES

# *Finishing Facts*

## New Possibilities for Silver Coatings

SILVER coatings can be applied by several methods, some of them rapid and quite inexpensive. Moreover, silver, unlike nickel, tin, copper, cadmium and other metals, is not under priority regulation. Silver itself is highly resistant to corrosion, but, when applied in very thin coats, is likely to be porous, in common with similar coatings of other metals. Such coatings can be used, therefore, only where chemical attack or galvanic action are not severe. Coatings applied by chemical reduction and by vapor condensation are only a few millionths of an inch in thickness and are quite porous, but electrolytic coatings can be made relatively nonporous and entirely suitable for many purposes when 0.001 in. or sometimes even less in thickness.

Silver has been mentioned as a possible substitute for tin in coating cans and can be so used successfully when the higher cost as compared with tin is justified. It has been so applied on a very limited scale in applications where tin does not provide adequate protection.

For larger containers, such as pails or drums where repeated use is involved, electrolytic coatings of silver approximating 0.001 in. in thickness are feasible, both economically and from a technical standpoint, for a wide range of products and containers with such coatings can be used in contact with some products with which the usual tin and other coating materials are not adequate. Under some circumstances, silver is known to prevent spoilage of certain products which deteriorate in contact with other metals.

Silver is now being substituted for electrolytic coatings of nickel, chromium, and other metals, the supply of which is restricted and it is feasible to employ thin coatings of silver clad on steel backing in place of brass and other non-ferrous alloys which are reserved for war applications.

Although the whole subject of coatings, whether for containers or for other applications, is a complex one, a great deal of research relating to the use of silver for coatings has been done by the American Silver Producers' Research Project as well as under other auspices. Data thereon, collected by the Project, are available to manufacturers and the Project, now being directed by Handy & Harman, 82 Fulton St., New York City, is prepared to cooperate with manufacturers interested in promising applications of silver either in coatings or for other purposes.

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## Fading Rate of Paints

ABILITY to resist fading is a valued property of most paints and textiles. Two important evidences of fading—change of color and change of gloss—can now be measured by photoelectric methods developed within the past few years. In the June Journal of Research (RP1478), A. J. Eickhoff and R. S. Hunter describe a study in which photoelectric tri-stimulus measurements of color change

and photoelectric measurements of specular-gloss change were used to follow the fading of several paint samples. These were exposed both outdoors and to two machine treatments (A and B) designed to weather the samples at an accelerated rate. Thus, it was possible to compare numerically the rates of artificial and natural fading of the paints. The data show: (1) The treatment used with apparatus A caused fading which averaged 20 times as fast as fading outdoors, but the speed-up factor varied from roughly five times for one paint to roughly 40 times for another; (2) the treatment used in conjunction with apparatus B caused fading which averaged five times as fast as fading outdoors, but the speed-up factor varied from roughly three times for one paint to roughly 20 times for another; and (3) for almost every paint tested, the factor relating the speed of fading from treatment in apparatus A to the speed outdoors was more nearly constant through the whole fading process than the corresponding factor for treatment in apparatus B.

Thus, treatment A not only faded paints faster, but it provided a preview of the course of fading which was usually a better representation of outdoor fading than that provided by treatment B. The data collected during the study are noteworthy chiefly for the methods they demonstrate. These should be valuable for future studies of the fading of materials and for the examination of methods for accelerated fading.

---

## Substitute Cleaning Acid Aids Production

THE highly scientific mind of the chemist is augmenting the inventive genius of the tool equipment designer in speeding the production of

**500 LARGE CARTRIDGE CLIPS COATED PER MINUTE**

**1000 1" BUCKLES COATED PER MINUTE**

**with R-200**

**"SPEEDIP" Whirl Enameler and Coating Machine**

A combination dipping-whirling machine for completely coating large quantities of small parts with lacquer, enamel, paint, oil, wax, etc. • All operations are within the machine. Parts are dipped into coating material, raised and whirled. Time—as little as 30 seconds. Speeds up production — cuts finishing costs—saves coating materials. • Write for further details or send samples to be coated.

**RONCI MACHINE CO.**

**45 River Ave., Providence, R. I.**

warplanes to be used in America's all-out effort to defeat the Axis.

An example was seen recently in the announcement by the Vega Aircraft Corporation that the simple but ingenious substitution of phosphoric and chromic acid for the commonly used hydro-fluoric acid in the cleaning of sheet metal to be spotwelded has not only resulted in a cleaner, brighter surface but has also helped step up production of B-17F "Flying Fortresses" and Vega Ventura bombers.

Under the system previously used, and still in use throughout the industry, the tendency of the aluminum sheet to alloy with the copper tip of the spotwelder has necessitated the cleaning of the tip after every ten or fifteen spots. Bennett Lewis, welding engineer at Vega, states that when using a combination of phosphoric and chromic acids the tips do not have to be cleaned oftener than every 500 or 800 spots.

"We have made as many as 3,300 spots without cleaning the tips," Bennett declared. A further advantage of the new solution, which was worked out by Dr. W. F. Hamilton, head of the chemical division of production research at Lockheed, is that the sheet metal may be left in the tank from an average of three or five minutes up to half an hour without injuring the metal. Under the old method, immersion in the acid had to be timed almost to the second. The same soap tank and hot rinse is used in connection with the new solution as was employed before.


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WASHING MACHINE DIVISION

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## Army Saves Millions of Pounds of Brass by Development of New-Type Buttons

BY substituting steel and zinc buttons, coated with brass, for those made of solid brass, the Army will save millions of pounds of this critical metal on future procurements of clothing for enlisted men, aviation students and nurses, the War Department announced recently.

The new buttons were developed by the Quartermaster Corps research staff. They look exactly like the old ones and have given satisfactory performance tests under exacting conditions. What is even more important, they utilized only about 30 per cent of the amount of brass previously used.

## Weather Resistance of Porcelain Enamel on Iron Structural Units

THE recent increase in the use of porcelain enamel on architectural units, and the diminished availability of zinc and tin for galvanized roofing and siding have accentuated the need on the weathering resistance of this type of protective coating.

In 1939, W. N. Harrison and D. G. Moore began a study on the weathering properties of 14 types and colors of enamel, including glossy, semi-mat, and mat finishes in both acid-resistant and nonacid-resistant compositions. This study, which is still in progress, involves a total of 864 one-

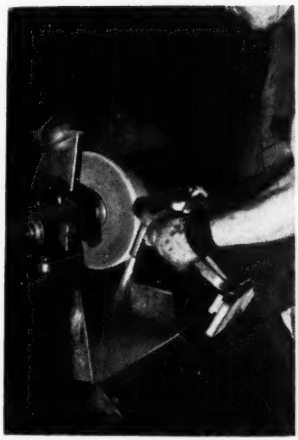
foot-square panels and an equal number of four by six inch laboratory specimens. Installation of specimens in racks for exposure at four selected locations (Washington, D. C.; St. Louis, Mo.; Lakeland, Fla.; and Atlantic City, N. J.) was completed in 1940.

At the end of the first year of weathering, all panels were inspected. As reported in RP1476 in the Journal of Research for June, the changes in the enamel surface were, for the most part, slight. In most cases, comparison with a storage panel of like composition was necessary to render any changes which had occurred visible to the naked eye. Even where the effects of weathering were readily visible, changes were confined to the surface of the enamel only; no failure of the enamel coating to protect the underlying metal from rusting was discovered.

The first year inspection resulted in the following observations: (1) The glossy, acid-resistant compositions were in excellent condition at all locations. (2) The nonacid-resistant enamels, as a whole, showed evidence of weathering. (3) The mat enamels appeared to be unsuited for architectural use where appearance is important, because of fading and the difficulty of cleaning them. (4) Some of the colored nonacid-resistant enamels were slightly faded after one year because of tiny pits on the surface, caused probably by acid-formgases such as carbon dioxide and sulfur dioxide in the atmosphere.

The pitting of the nonacid-resistant enamels was produced in the laboratory by subjecting them, while immersed in water, to carbon dioxide under slight pressure. Subsequent thorough drying was necessary to bring out the pits.


NB LIONITE Steps Up Production of Polished Parts..



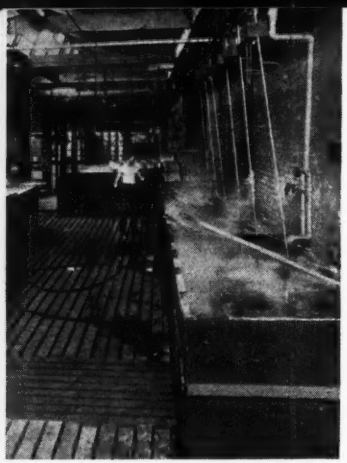
For use with cements in polishing wheels, NB Lionite is unexcelled. Some users report production increases of from 25% to 100% since they started using NB Lionite in place of ordinary abrasive grains.

On those polishing operations which closely approach grinding, of which there are many in our war industries, NB Lionite is in a class by itself. The polyhedral shaped grains with their tough, sharp, cutting points are free from non-productive flats and slivers, and cut fast and smoothly.

NB Lionite is working 24 hours a day polishing parts for aircraft engines, propellers, ordnance, range finders, machine tools and innumerable other war materials. Our entire capacity is devoted to producing abrasive grains for plants engaged in war work. Every effort is made to ship these orders the day they are received.

*SALES REPRESENTATIVES IN ALL PRINCIPAL CITIES.*

**GENERAL ABRASIVE COMPANY, INC.**
NIAGARA FALLS, N. Y., U. S. A.



# News OF THE INDUSTRY

## Pennsalt Plans to Aid Industries Conserve Chlorine

One of the country's largest manufacturers of chlorine has announced plans to help metal fabricators use cleaning methods other than chlorinated solvents to help conserve chlorine.

The Pennsylvania Salt Manufacturing Company, 1000 Widener Bldg., Philadelphia, Pa., has increased the staff of its Industrial Cleaner Division by 65 per cent to cooperate in solving the critical problem posed by the War Production Board's recent warning to industry to use other than chlorinated solvents in metal cleaning operations.

"The impending chlorine shortage need not be as disastrous in the metal cleaning field as at first feared," said William P. Drake, manager of the company's cleaner division. "Industry, of course, is concerned with the conversion of chlorinated solvent type machines so that alkaline cleaners may be used in them.

"Undoubtedly some of these machines will have to be temporarily set aside, but in many cases equipment can be converted to pressure spray washers or immersion tanks in which alkaline cleaners can be used. Each problem has its own peculiarities requiring the attention of a chemical or industrial engineer who has a thorough knowledge of the application of both chlorinated solvents and alkaline cleaners.

"Tremendous progress has been made in the last 10 years in the development of alkaline cleaners. For example, the various sodium silicates, such as the metasilicates, sesquisilicates and more recently the orthosilicates have been developed. In fact, the majority of proprietary cleaners on the market today contain silicates in one form or another.

"Literally hundreds of surface active or wetting agents have been developed, and polyphosphates have taken their place in developments which are contributing a great deal to improved alkaline compounds.

"At the time of the last war, caustic soda, soda ash, trisodium phosphate and mixtures of these were the only alkalies available."

Because of the company's experience in Canada, where the chlorine shortage occurred many months ago, the company built a new plant near Detroit where added production of alkaline cleaners started last November. The company's staff of chemical and industrial engineers is now in the field advising metal fabricators on the current problem.

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## Du Pont Electrochemicals Department

The change in name to Electrochemicals Department for one of the manufacturing units most basic in the production of chemicals for peace and wartime uses has been announced by E. I. du Pont de Nemours & Company, Wilmington, Delaware.

This group of activities was originally known as The R. & H. Chemicals Department. The change was effective June 1. The new name was chosen because it describes the type of products created by this department without being broad enough to encroach upon the activities of the nine other operat-

ing departments of the company.

Electrochemicals Department emphasizes chemicals rather than processes and covers all chemicals which are derived, directly or indirectly, from electrochemical reactions. These are the type of chemicals which constitute the bulk of this department's manufacturing activity, it being a leading factor in the field of electrochemicals and specialized chemicals used in electroplating, metal cleaning, bleaching, refrigeration and ceramics.

The original name arose from the fact that the department was created after the acquisition by Du Pont in 1930 of The Roessler and Hasslacher Chemical Company. Subsequently the company was dissolved and its assets and business were consolidated with the parent organization into The R. & H. Chemicals Department. Under that name the department has been a leading producer of chemicals made by electrolytic processes. At its largest plant, sodium and chlorine are produced electrolytically.

Sodium cyanide and sodium peroxide are made from metallic sodium as a basic raw material. The first is used in the preparation of various metal cyanides, in electroplating, and in the case-hardening of steel.

## Detroit Rex Products Opens New England Branch Office

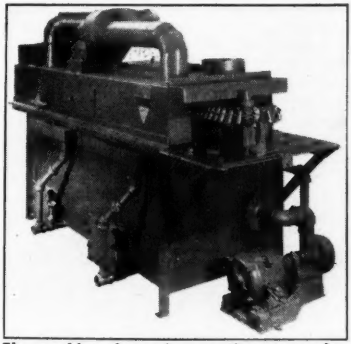
In line with its recently expanded service policy in the metal cleaning industries, the Detroit Rex Products Company announces the opening of a New England branch office at 8 W. Main St., Meriden, Conn., telephone Meriden 688.

## Electroplating Correspondence Course

For several years a correspondence course in electroplating by Dr. Young has been available. There are 12 lessons in chemistry and 12 in electroplating. The course has been sent to a number of men in the United States and Canada, complete with laboratory chemicals, glassware, materials, and so forth. At present this is being discontinued due to the problem of supplies. However, the lectures alone can now be obtained at a greatly reduced price.

The cost is $12.00 for the complete lectures in chemistry and $12.00 for the complete lectures in electroplating — $24.00 for the complete set of 24 lectures. A laboratory manual for the plating


TAKE THE SLOW SIGN
OFF YOUR PRODUCTION LINE



*The machine shown is a continuous washer with an automatic discharge for 20, 37 and 40 MM projectiles.*

**Costly time consuming hand operations can be eliminated in your production work by the use of the overhead monorail type conveyor and Blakeslee Metal Parts Washing Equipment. You can take the SLOW sign off your production line and speed up machining and finishing operations by quickly and thoroughly cleaning stampings, castings, metal assemblies and all screw machine products with Blakeslee engineered-for-you equipment. Write today for full details on Blakeslee's Metal Parts Washing Machines and Solvent Degreasing Equipment. *Write or wire for rush quotations on any war defense contract requirements.***

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course can be purchased for $2.00.

There is only a limited supply of each set. If you desire either, or both, send check or money order with a letter so stating to Dr. C. B. F. Young, Box 292, Flushing, New York.

## M. L. Hahn to Serve in Oakite Territory

Mr. M. L. Hahn has been appointed by Oakite Products, Inc., to serve in its Southern Ohio territory. Mr. Hahn is taking the place of Mr. Fait, who formerly represented this territory.

M. L. Hahn

Mr. Hahn has a thorough knowledge of the application of Oakite materials and methods to the many important production and maintenance problems of industry.

## Facilities Expanded for Manufacture of "Tygon"

Because the demand for "Tygon" synthetic rubber-like products has been growing so rapidly during recent months, The Chamberlain Engineering Ltd., a unit of The United States Stoneware Co., Akron, Ohio, has recently purchased a 10 acre group of buildings at Ravenna, Ohio. The property consists of six buildings, with 50,000 sq. ft. of floor space.

All buildings are being extensively remodeled with much new plant equipment being installed. Separate buildings will be devoted to such departmentalized activities as: Synthetic resin manufacturing and processing; corrosion-resisting linings for the chemical, process, and allied industries; protective paints and coatings; metal and alloy fabrication; and corrosion-resisting cements.

The manufacture of "Tygon" heavy-duty tank linings, "Tygon" tubing, "Tygon" gaskets, and "Tygon" corrosion-resisting paints will shortly be transferred from Tallmadge, Ohio. When these new Ravenna production facilities are in full operation, they will then be ample for the handling and lining of full sized tank cars and for any size of steel plate construction that can be transported on railroad flat cars.

## Jobbers Play Part in Conservation

Jobbers are playing an important part in the planned conservation campaign now being conducted by Manning, Maxwell & Moore, Inc., of Bridgeport, Conn. Each month M. M. & M. jobbers are doing their part in distributing tens of thousands of folders telling how to make the products made by M. M. & M. last longer.

Some 1,500 stock carrying jobbers of this concern are said to be enthusiastically embracing this M. M. & M. Conservation Campaign, because it builds good-will for these jobbers at a time when priorities on M. M. & M. products make them difficult to get. Last month the folder, distributed by the jobbers, carried the story, "How To Make Your Thermometers Last Longer"; this month it is, "How To Make Your Globe Valves Last Longer."

One reason why these instruction pamphlets are so well received is that they are impartial—the suggestions will be just as helpful when used on competitive products. In coming months, M. M. & M. jobbers will be supplied with additional folders carrying the messages, "How To Make Your Pressure Gauges Last Longer," and "How To Make Your Safety and Relief Valves Last Longer." All pamphlets are interestingly illustrated with thumbnail sketches.

The jobbers are assisted in the distribution of these M. M. & M. Conservation Folders by the company's own salesmen and direct mail. The makers state that anyone else interested in these folders may have a set for the asking.

## Pennsalt Plans $1,750,000 Plant

The Pennsylvania Salt Manufacturing Company, 1000 Widener Bldg., Philadelphia, Pa., manufacturer of chemicals, recently announced that it has arranged a contract with the Government for the construction and operation

of a new plant in the Philadelphia area for the manufacture of materials used in war goods production.

Financing for the plant, which will cost $1,750,000, will be provided by the Defense Plant Corporation. Construction will begin immediately and the plant is expected to be in operation within six months. Design and construction contracts have been awarded the firm of Day and Zimmerman, Philadelphia.

"We cannot announce the exact character of the new plant's production," said Leonard T. Beale, president of Penn Salt, "but it will fill a vital need in many fields of war goods production. The new plant will greatly increase our participation in the war effort. At present, 55 per cent of our entire output goes into the manufacture of war goods."

## Detroit Rex Products Announces Expanded Cleaning Service

The change-over of the metal industries from domestic to war production, combined with the rapid turn-over in personnel in many plants, has placed a serious strain on the efficient operation of industrial cleaning equipment.

To better serve the users of all kinds of cleaning equipment and materials, the Detroit Rex Products Company, 13017 Hillview Ave., Detroit Mich., is increasing its service engineering force by adding over 30 per cent to the number of its field personnel.

This new free service includes consultation on all types of cleaning operations and methods, and the training of new operators of cleaning equipment in its correct operation and maintenance. Efficient use of equipment, the conservation of cleaning materials, and the cleaning of work to meet the most rigid specifications of quality and speed are vitally important.

## Report on AES National Convention

One of the most successful national conventions of the American Electroplaters Society in which more than 525 registered members participated terminated the three-day meeting beginning June 8 with a gala banquet and dance at the Hotel Pantlind, Grand Rapids, Michigan. The interest shown in the educational sessions was gratifying to those in charge and proved that war


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Now YOU CAN PROCESS MAGNESIUM Safely

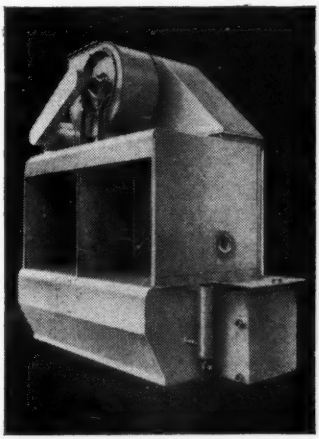
The dangers of processing magnesium are eliminated with the introduction of Hydro-Whirl.

Because its chief component is a rotor (and not a pump which necessitates a screen that constantly needs attention) the results obtained through this unit are exceptionally effective. There is nothing to be clogged up by the lint produced by buffing wheels. The cleaned air is returned to the room.

SIGNIFICANT SAFETY FEATURES

HARDWOOD GRATING—*Eliminates danger of sparks.*

BOOTH LINED WITH MASONITE—*Added protection against spark ignition.*



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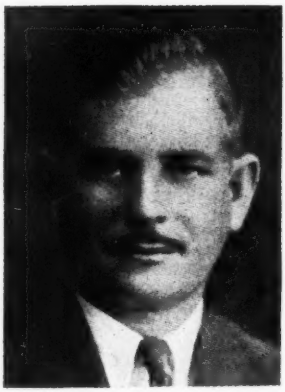
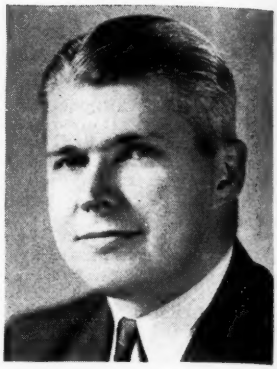
# *Newly Elected National Officers American Electroplaters' Society*



GEORGE WAGNER
First Vice-President
Hy-Grade Electroplating Co.
Newark, N. J.



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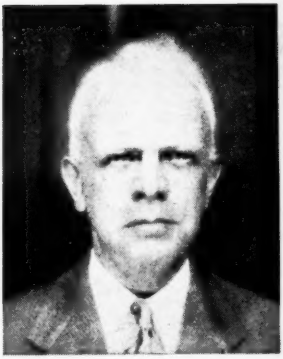
Grand Rapids, Mich.

CHARLES C. CONLEY
President
Stolle Corporation
Sidney, Ohio

CLARENCE C. HELMLE
Third Vice-President
General Electric Company
Bridgeport, Conn.



W. J. R. KENNEDY
Executive Secretary
93 Oak Grove Ave.,
Springfield, Mass.

conditions have a stimulating effect for those eager metal-finishing executives who desire to do a better job by learning more about new methods and processes.

The most important business which was considered at the final business meeting consisted largely in an attempt to formulate a new name for the Society which would include all those engaged in metal finishing, thus combining men in the plating and organic finishing field. After a lengthy discussion, it was decided to refer the suggestion for naming the Society to a committee which would take the matter under advisement and make a report at the next national convention.

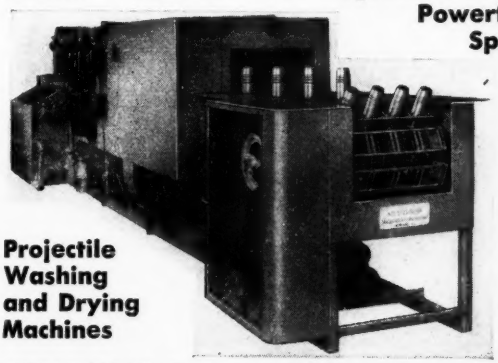
Buffalo, New York, has been selected as the next convention city for 1943 or at such a time as war conditions deem it advisable. The Hermina Proctor Award of $100.00 for the best paper presented at the convention was awarded to Harold Ransburg, of Harper J. Ransburg Co., Indianapolis, Indiana, for his paper, "Electrodepositing Paint Spray." Frank Clifton and W. M. Phillips, both of the Electro - Chemistry Department, General Motors Corporation, Detroit, Michigan, received the Founders' Gold Medal for their paper, "Bright Copper Plating in Acid Baths." The Honorable Mention was awarded to Carl E. Heussner, Engineering Division, Chrysler Corporation, Detroit, Michigan, for his paper "Comparative Tests of Ocean Water Spray vs. Standard Salt Spray."

The award of $50.00 for the best paper published in the "Monthly Review" during the past year was awarded to Manuel Sanz, of the Staff, University of Southern California, and presently associated with Process Engineering group, Vultee Aircraft, Inc. The title of his paper was "Chromic Acid Baths for Anodizing or Chromatizing Aluminum or its Alloys." The Honorable Mention for this award was presented to W. M. Tucker, Roll Coating Finishing Laboratory, Eastman Kodak Co., for his paper, "The Technique of Heavy Nickel Plating."

The A.E.S. Gold Medal was presented to Frank K. Savage, Research Chemical Engineer, C. G. Conn, Ltd., Elkhart, Indiana, for his paper presented at the convention entitled "Anode and Cathode Phenomena Shown by Color Photography."

The International Fellowship Club elected the following officers for the coming year: Charles Schlott, president; William M. Cole, first vice chairman, and Frederick Gumm, second vice chairman.

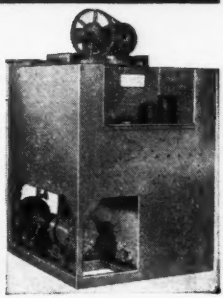

**Short Cuts in Operating Costs**



**Powerful Motorized Spray Rinse UNIT**
For Racked or Other Parts
*Very Economical in Water Consumption*

**Projectile Washing and Drying Machines**

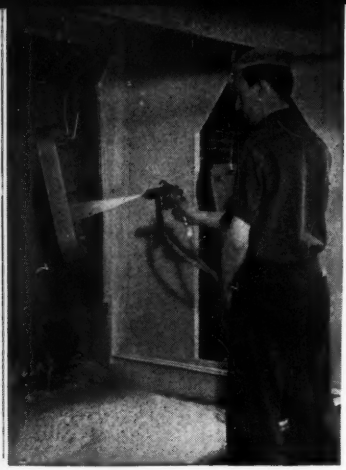
**Rotary Table Washer**
For Shells and Containers



***METALWASH Equipment for - -***

**Artillery Cartridge Case Spray Pickling and Process Machine for brass and steel cases • Small Arms Cartridge Rotary Pickling and Process Machines • Mouth and Taper Anneal and Treatment Process Machines • Projectile Washing Machines • Projectile Quenching Machines • Special Washing and Treatment Machines for Ordnance and Artillery Components**

METALWASH MACHINERY CO.,
27-29 Haynes Avenue Newark, N. J.

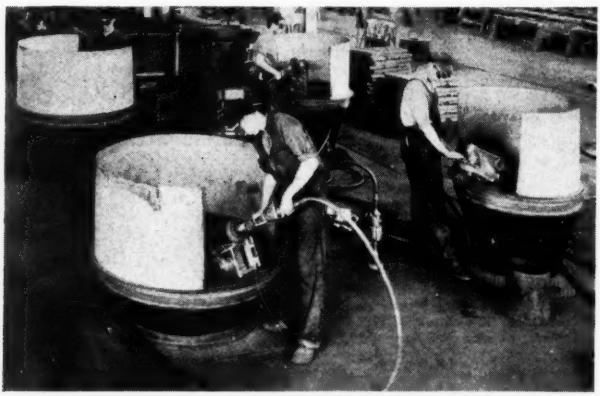


# New PLANT EQUIPMENT AND Materials

## K & B Down Draft Dust Control System

The Kirk & Blum Mfg. Co., 2816 Spring Grove Ave., Cincinnati, Ohio, has developed the K & B Down Draft Dust Control System shown in the accompanying illustration. By means of this system, dust is carried off through ducts constructed under the floor, thereby saving floor space, and so on. Bench-high gratings, through which air is exhausted, enable operators to conveniently handle castings for sanding, snagging, grinding, polishing, and buffing.

The K & B Down Draft Dust Control System is said to be particularly adaptable in the finishing departments of machine tool plants. With the system, it is claimed, castings can be ground and sanded within a few feet of precision machinery without the necessity of partitions or curtains. All dust particles are said to be carried down through the gratings as fast as they are released, thereby providing a clean atmosphere.



K & B Down Draft Dust Control System in Use

## Oakite Anodic Degreasing Material

Specially designed to meet war demands for faster cycles in anodic degreasing or reverse current cleaning of cold rolled steel parts before finishing, a newly developed alkaline-type material has been announced by the Technical Research Laboratories of Oakite Products, Inc., 20 Thames St., New York City. This development is now being successfully used to speed up production of a wide range of war supply items, such as gun mechanisms, control instruments, aircraft forging and bearings, airplane propeller hubs and engine parts, armor-piercing shells, and tank transmission gears and tread parts.

Known as Oakite Composition No. 90, this new material is reported to provide several original, exclusive features

which mark it a basic contribution to faster production, more uniform results, low unit cost and long solution life. Due to its high conductivity, ready adaptability to hard water conditions, effective smut-removing properties and fast wetting-out action, the material is said to remove oil, grease, smut, polishing and buffing compounds on the consistently thorough, speedy basis required where a large volume of work is handled and where fast, effective soil removal is essential. The material, it is claimed, has been found particularly advantageous to plating departments and contract finishing shops using the Bullard-Dunn Process for the tin coating of steel parts.

## "Dresinate"

A wetting and emulsifying agent, to be known as "Dresinate," for use in conjunction with all types of alkaline metal cleaners has been developed by the research department of Hercules Powder Company, Delaware Trust Bldg., Wilmington, Delaware.

Dresinate assists aqueous alkaline solutions in certain applications to replace some of the chlorinated solvents, now scarce because of the shortage of chlorine. The Chemical Branch of the War Production Board, the company said, has recently urged metal fabricators to investigate cleaning methods which use no chlorinated solvents.

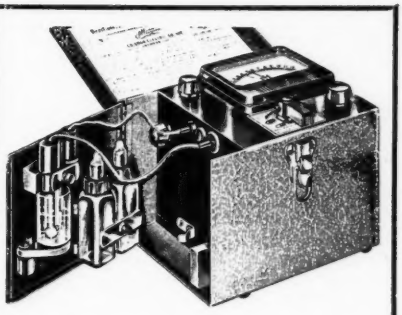
The penetrant, a finely divided, uniform powder, is available in practically unlimited quantities at a lower cost than the common emulsifying agents used by the metal cleaning industry, the company's announcement says.

The new cleaning aid is suggested for use in conjunction with trisodium phosphate, sodium metasilicate, caustic soda, soda ash, borax, and other alkaline detergents. Its use is indicated for cleaning metal prior to rust-proofing, lacquering, painting, or plating.

Research work carried on at the Hercules Experiment Station indicates the material is suitable for all metal cleaning operations where an alkali cleaner is used to remove grease, oils, soil and organic materials.

"Addition of 3 to 15 per cent Dresinate to an alkaline cleaning solution, while it reduces the alkalinity slightly, nevertheless increases the detergency of the solution," the company says.

"The wetting action of Dresinate puts

**Perfect pH Control**

★ **Direct reading. For *Quick* operation in the plant!**

★ **Ask for Bulletin PF 742 describing the *Coleman pH Tester*, mentioning best priority rating available!**

LABORATORY SUPPLIES AND CHEMICALS
WILKENS-ANDERSON CO
111 N. CANAL ST. CHICAGO, ILL.

•AUTOMATIC POLISHING & BUFFING MACHINES
Packer-Matic
THE PACKER MACHINE CO., MERIDEN, CONN., U. S. A.

MEETING

WAR PRODUCTION DEMANDS
**POLISH and BUFF *Automatically***

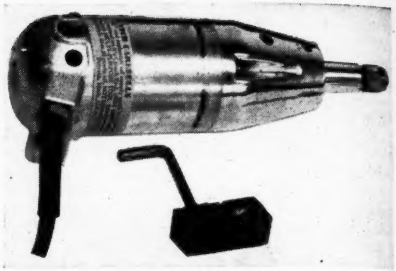
a thin film of alkaline liquid uniformly over the metal surface, wetting out oily areas equally as well as areas free from oil. The emulsifying action assists the alkaline cleaner to get the foreign material in suspension and carry it away.

## "Kum-Kleen"

To provide industries with a substitute for metallic name plates, identification, patent number, instruction tags, and so on, due to the conservation of all types of metal, Avery Adhesive, 451 E. Third St., Los Angeles, Calif., has developed a product to be known as "Kum-Kleen" which is said to adhere permanently to any smooth surface of metal, glass, plastic, enamel, wood, and so on. According to the manufacturer, "Kum-Kleen" can be applied without moistening and will adhere even when exposed to high temperatures or changing climatic conditions.

## H & H Rubber-Abrasive Polisher

H & H Research Co., 12540 12th St., Detroit, Mich., announces the addition of a rubber-abrasive polisher to its line of portable electric filing and honing tool accessories. The polisher consists of a rubber pad impregnated with abrasive which may be formed in any size up to 3 x 1 in. square and is mounted on a 2-in. offset holder for use with H & H Senior Model Reciprocating Action Portable Electric Filing and Honing Tools. The polisher is available in grits ranging from 80 up to 180 and in various shapes within the above dimensions.



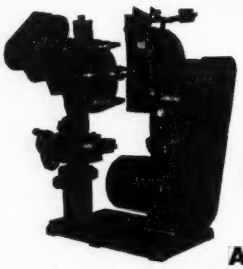
H & H Rubber-Abrasive Polisher

The H & H Rubber-Abrasive Polisher can be used to produce and maintain a mirror-like polished finish on dies, molds, and so on. Scratches produced by files which are invisible to the human eye are said to be brought out plainly and removed while producing a polished surface.

## "Silco-Black"

A finishing material, compounded from an inorganic base, to be known as "Silco-Black," has been placed on the market by The Mitchell-Bradford Chemical Co., Seymour St. off Bruce Ave., Bridgeport, Conn. In use, the product is sprayed, then dried at 250 deg. F. for several minutes then baked at 350 deg. F. for 15 minutes or longer. The "Silco-Black" finish is said to with-


Get Hep to This for Polishing and Buffing! Faster and Cheaper



ACME SEMI-AUTOMATIC and Lathe Combination Unit

One of the many Acme Automatics designed to speed up production and reduce production costs. Send sample for free production estimate.

ACME Manufacturing Co.
1642 HOWARD ST. • DETROIT, MICH.



PREPARE METAL FOR PAINTING WITH

SOL-KLEAN

INDUSTRIAL CHEMICAL PRODUCTS CO.
DETROIT
Milwaukee Ft. Wayne

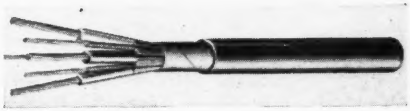
stand a salt spray test of 200 hours or more without corroding. The finish is recommended particularly as a substitute for cadmium plating, zinc plating, and galvanizing.

Silco-Black finish is said to be exceptionally resistant to abrasion. It is unaffected by organic lacquer and solvents and is also said to resist acids and mild alkalies. The finish resembles vitreous enamel in the quality of being inelastic, but adheres tenaciously to steel, brass, and also chrome plate. Silco-Black finish produces an eggshell surface which may be pumiced to produce an unusually attractive finish for decorative applications.

## G-E Flamenol Bus-Drop Cable

A non-rubber flexible Flamenol Bus-drop Cable for 600-volt branch circuits has been announced by the Wire and Cable Division of the General Electric Co., Schenectady, N. Y. By means of the cable, connection from bus bar to machine can be readily and economically made. Besides using no rubber, the cable requires no conduit, thereby saving steel.

According to the manufacturer, the G-E Flamenol Bus-drop Cable is highly



Section of G-E Flamenol Bus-drop Cable with Insulation Removed from One End

resistant to oils, acids, alkalies, and coolants and will not support flame. In addition, it is easy to handle, easy to bend, and is said to be resistant to abrasion.

The conductors of the cable are soft-drawn dry - bright - annealed stranded copper, the strands being protected by a coating of tin or other suitable material. Each conductor is insulated with the same synthetic as that used on G-E Flamenol Wire, the thickness of the insulation being in accordance with A.S.T.M. Specification D-27. For quick identification, the conductors are insulated in red, white, and black.

Ground wires conform to the same electrical and physical properties as the conductors and are provided with green braids of cotton. The aggregate area of the ground wires is equal to the circular-mil area of one of the main con-


# Keep Your AIR LINES Clean with SPRACO OIL & WATER EXTRACTORS

Dirty compressed air with a high percentage of moisture and oil is very effectively cleaned by passing it through a Spraco Condensing Type Oil and Water Extractor. A cooling coil lowers the temperature and condenses the moisture and oil vapor on a series of baffles in the air stream. The accumulated oil and water is discharged through an automatic drain valve. Made in 2 sizes of 40 and 100 cubic feet for working pressures up to 125 pounds.

Write for "CONDENSING TYPE OIL AND WATER EXTRACTOR BULLETIN"

SPRAY ENGINEERING CO.
111 CENTRAL ST. SOMERVILLE, MASS.

ductors. The three insulated conductors are twisted together with the ground wires, in combination with dry jute in each interstice, to form a hard, compact core, over which is applied a tape and jacket overall of the same synthetic insulation as that used on the conductors.

## Burgess De Luxe Industrial Model Acousti-Booth

A new modern Acousti-Booth, finished in attractive walnut color, is announced by the Burgess Battery Company, Acoustic Division, 2825 W. Roscoe St., Chicago, Ill. This new booth is part of the line of wooden booths being developed to enable the company to supply industrial users without priorities or other restrictions. This booth conserves steel for national defense because no critical materials are used in its construction.

The walls and ceilings in the new Model 210 Acousti-Booth are constructed of heavy reinforced birch plywood panels, filled with a thick blanket of sound-absorbent material. The inside walls of the booth consist of a heavy perforated plywood facing, which protects the sound-absorbent material. This combination of perforated plywood and the sound absorbent material which it protects is a patented Burgess development. These acoustic panels are said to blot up factory noise and create a remarkable "zone of quiet" in the booths.

Burgess De Luxe Industrial Model Acousti-Booth

This new Burgess Acousti-Booth is designed for use in mills, factories, power houses, and other noisy industrial locations. Like other Acousti-Booths, it has no doors because it needs none. According to the manufacturer, factory racket is absorbed so completely by the lining of the booth that telephone calls can be made without interference, even under severe noise conditions. Errors due to confusion in 'phoned orders is eliminated. Privacy is assured because conversation in ordinary tones within the booth cannot be understood outside.

The open, doorless construction of the Burgess Acousti-Booth allows ample ventilation. Maintenance is practically eliminated, because there are no locks, hinges, or other mechanical parts to cause trouble. These Acousti-Booths are designed with rounded corners and sturdily built to prevent damaging when used in busy shops or factories.

The Model 210 Acousti-Booth is supplied attractively finished in walnut,


THE ADIRONDACKS GORE MOUNTAIN CRYSTAL GARNET ORE

ABRASIVE GARNET

For

Abrasive Paper and Cloth
Grinding Wheels
Sand Blast
Minus 300 Mesh for
Polishing and Lapping
Grades for Barrel Finishing

*Ample Stocks Insure Prompt Shipment*

BARTON MINES CORPORATION

NORTH CREEK, WARREN COUNTY, N. Y.



BETTER PLATING, LESS COST!

"MGC" ELECTROPLATING EQUIPMENT

*Write for Interesting Details TODAY!*

MOTOR GENERATOR CORP., HOBART SQ. Box PF-72 TROY, OHIO

with light wood interior. It may also be obtained unfinished to permit finishing to suit your requirements. A shelf is provided for the telephone instrument and for taking notes. Overhead electric light fixture with pull-chain provides ample illumination. Outside dimensions are 30 in. wide by 79½ in. high by 38 in. deep. The front opening is 24 in. wide.

## Ideal Commutator Cleaning Stone

Excess film and dirt caused by heavy, continuous power loads are said to be easily and quickly removed from commutators with a new cleaning stone announced by Ideal Commutator Dresser Company,1031 Park Ave., Sycamore, Ill.

The Ideal Cleaning Stone cleans while the motor or generator is running. It may be used by simply holding it against the commutator and slowly moving across the face. Does not clog, nor cut the commutator. It also cleans film from the brush seats and helps to re-seat brushes.

So-called excess color, skin, or film resulting from oxidation around chemical plants, diesel locomotive generators, and so on, are said to be removed, only the "electric film" remains on the commutator, assuring perfect commutation.

Regular use of the Ideal Commutator Cleaning Stone will help in keeping motors and generators on the job 24 hours a day. Only a clean commutator can be expected to function properly. The Ideal Cleaning Stone will also improve brush performance, reduce noise, even distribution of brush contact drop and brush wear, and reduce chattering and sparking.

## Fresnel Luminaires

For lighting industrial fences and areas for protection against sabotage, Fresnel Luminaires are announced by the Westinghouse Lighting Division, Westinghouse Electric & Mfg. Co., Cleveland, Ohio. Two types are available, SF-180 and the MF-180, for series and multiple circuits respectively.

Units can be mounted on poles and building walls and consist basically of a hood with socket and receptacle, mounting bracket, a reflector and lens assembly.

Westinghouse Fresnel Luminaire

The hood is made of cast iron. The lower part of the casting has a flange for watershed and breather to avoid creation of a vacuum due to sudden cooling of the luminaire by rain. Moistureproof felt gaskets form a weatherproof and bug-proof seal between the hood and the reflector. Units with side mounting plates are gasketed with graphitized asbestos.


CUT DOWN REJECTS WITH ORVUS IN YOUR METAL CLEANING BATHS

This sulfated fatty alcohol Cleansing Agent is EFFECTIVE

—as a surface tension lowering agent
—as an emulsifier
—in dispersing lime soaps which might cause poor plating results if permitted to deposit on the metal

*Write for further information about Orvus to*

PROCTER & GAMBLE, Cincinnati, Ohio

*For a real good polishing job use*

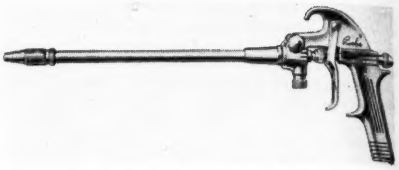
KEYSTONE EMERY

TURKISH — NAXOS — AMERICAN

KEYSTONE EMERY MILLS *Write for Sample* 4316 Paul St., Phila., Pa.

## Binks Cleaning Gun

The Binks Manufacturing Company, 3114 Carroll Ave., Chicago, Ill., is now marketing a cleaning gun which is said to have proved very popular for spraying various kerosense type cleaning fluids. The Binks Cleaning Gun is equipped with pistol grip, adjustable material control, adjustable nozzle, and ¼ in. standard pipe thread air connection. The unit uses approximately 40 c.f.m. at 40 to 50 lbs. pressure. It can be used with a quart syphon cup or with a suction hose running into an open container. The net weight of the unit is 1½ pounds.

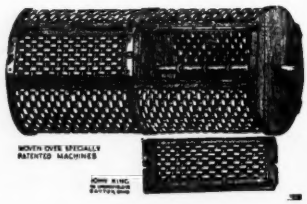


Binks Cleaning Gun


IN TIMES OF NEED

INVESTIGATE

KING



PLATING BARRELS

SIZES FOR ANY EQUIPMENT

Write for illustrated folder.
*Use them once—you'll use them always*

JOHN KING
48 SPRINGFIELD ST. DAYTON, OHIO


## Gunk XP-92

A hand wiping safety solvent to be substituted for naphtha, gasoline, or kerosene, to be known as Gunk XP-92, has been announced by the Research and Development Laboratory of the Curran Corporation, 6 Pleasant St., Malden, Mass. This material is designed primarily for removing cosmoline from the rifles issued to troops.

According to the manufacturer, Gunk XP-92 is also applicable for wide industrial use as a naphtha substitute for grease cleaning and hand wiping operations in ordnance factories or shell plants. This material is described as a unique safety solvent due to the fact that it does not de-oil the skin, has no toxic vapors, has no flash or fire point, and leaves an invisible rust preventive film so thin it cannot be detected.

## Butterfly Valve for "Blitzkreig" Service

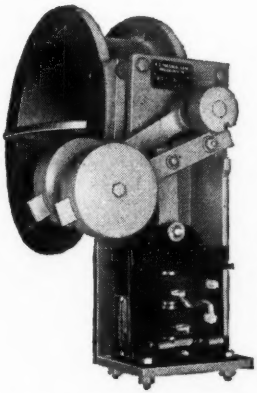
A recent application of the butterfly valve for emergency duty has met enthusiastic reception because of its

UNIFORM DEPOSITS, BETTER FINISHES — USE HARSHAW ANODES *AND* CHEMICALS

THE HARSHAW CHEMICAL COMPANY
Cleveland, Ohio and Principal Cities

quick, automatic action, according to an announcement by R-S Products Corporation, 4530 Germantown Ave., Philadelphia, Pennsylvania.

This solenoid operated valve provides two-position control — either automatic opening or wedge-tight shut-off in case the electric power fails or is turned off due to any war emergency. In an open position the butterfly vane is held open by the magnetic action the solenoid. When the electric power is shut off the trigger is tripped and the counter weight closes the butterfly vane by gravity, wedge-tight against the body of the valve.



Butterfly Valve for "Blitzkrieg" Service

In case of fire due to incendiary bombing, for instance, the valve in a gas or chemical line would be set for automatic closing. Should explosive or poisonous gases escape, automatic opening of an air pressure line would minimize the danger of personal injury or property damage.

The valve itself can be constructed of any metal alloy and in various sizes for air, gas, steam, oil, hydraulic, and other services. It must be reset by hand.

## Nielco Alkali Type Aluminum Cleaner

An alkali type aluminum cleaner designed specifically for the surface conditioning of aluminum prior to spot welding has been placed on the market by Nielco Laboratories, 19720 Flor-


**HEAT AND ACID RESISTANT BASKETS AND CRATES**

THOUSANDS OF HOUR-PROVEN USE

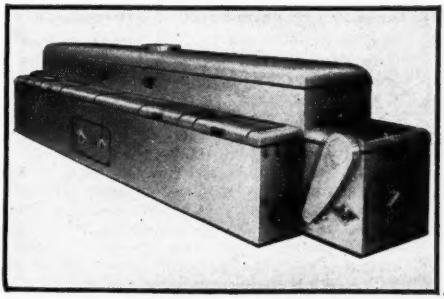
Every size and shape for every metal finishing and handling operation, whether the load is two ounces or two tons.

***Send blue prints and specifications. Ask for catalog.***

**ROLOCK INC**

1400 KINGS HIGHWAY E., FAIRFIELD, CONN.





**HYDRO-FLOW**
**Industrial Washing Machines**

Streamlined design. Hidden motors, pumps and pipes are easily assembled. Piping and nozzles located to insure thorough cleansing of all surfaces. Rugged and efficient pressure pump. Corrosion resistant spray nozzles—from mist to open stream. Monorail, Belt or Gravity type conveyors designed to carry any shape or size material. Variable speeds on conveyor drive synchronize production.

**International Conveyor & Washer Corp.**
*Write for circular.*
640 E. FORT ST. DETROIT, MICH.

ence Road, Detroit, Mich. This cleaner was developed for the automobile industry when it began gearing for the production of aircraft and a check was made into means and materials whereby a reduction in the time required to produce the units to be built could be effected.

Nielco Alkali Type Aluminum Cleaner is said not only to reduce the time required to clean a sheet of aluminum to a perfect water-shed, but also to do this cleaning without building up an oxide coating. Panels of Alclad aluminum 1 by 5 in. out of .016, .032, and .051 stock were used to test the cleaner for its cleaning action and its freedom from etching. To be doubly sure that this cleaner would not etch any type of aluminum, the manufacturer used panels previously etched in an alkali etching solution and inhibited the cleaner against etching metal in this condition.

Aluminum panels were dipped into S.A.E. 50 lubricating oil and allowed to drain for one hour at room temperature. They were then submerged into the cleaning solutions at concentrations of 4 and 8 oz. of cleaner per gallon of water at 212 deg. F. According to the manufacturer, the oil was removed completely to give a perfect water-shed in one minute and 32 seconds at a concentration of four ounces per gallon, and in 42 seconds at eight ounces per gallon.

Panels coated with Army Air Corps Specification zinc chromate primer air dried for 48 hours, and panels coated with the primer and one coat of lacquer and air dried for 48 hours were submerged into the solution at a concentration of eight ounces per gallon at 212 deg. F. Both primer alone and primer and lacquer were said to be completely removed in five minutes.


**BLACK-MAGIC**

**"THE ONE BATH PROCESS"**

**Are you a successful contractor for War Department items of kitchen equipment, bake pans, roast pans, etc.?**

***BLACK-MAGIC* is an approved finish for these and other Quartermaster Depot items.**

**Send samples for finishing. *BLACK-MAGIC* costs less, looks better.**

***BLACK-MAGIC* processes for Iron, Copper and Zinc Die Castings.**

***WITCH-DIP*, a special wax base rust proofing dip.**

***Write for portfolio of complete information on processes and equipment.***

**The Mitchell-Bradford Chemical Co.**

**BRIDGEPORT, CONN. PHONE 7-1390**


## American Steel Wool

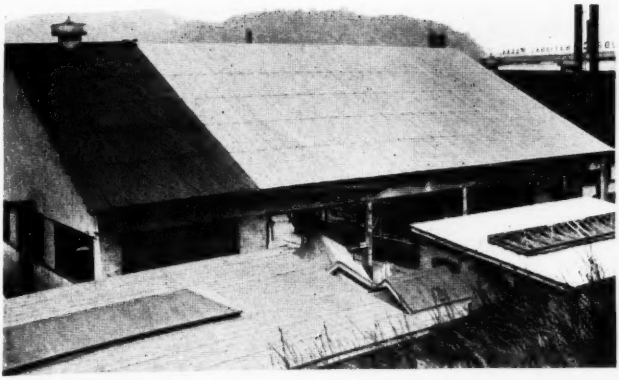
A new use has been found for steel wool. Up to now, the use of steel wool has been considered a hand operation. After much study in defense plants, American Steel Wool Mfg. Co., Inc., 42-24 Orchard St., Long Island City, N. Y., has produced a spindle made from Type A Ribbon American Steel Wool.

One of the most vital uses for Type A American Steel Wool in ribbon form is the removing of burrs from all nonferrous metals. This spindle is a very simple tool to make. Type A Ribbon Steel Wool is wrapped around a small shaft and then the completed shaft or spindle is mounted in a chuck. It is then ready for use. According to the manufacturer, it is possible to clear burrs from three sides and two edges in one operation. Also, when this spindle is in use, it is said to make no permanent grooves. There is no waste when using Type A Ribbon Steel Wool. When the spindle is worn down, it is only necessary to add an additional length of ribbon steel wool on that remaining on the spindle.

This application of Type A American Steel Wool in ribbon form is said to have reduced considerably the time required for removing burrs from nonferrous metals.

## "Plastipitch"

An improved method of weatherproofing prefabricated metal and shapes has been introduced by the Coated Products Corp., P. O. Box L, Verona, Pa. This process, by the utilization of "Plastipitch" is recommended as a substitute for galvanizing, rolled bituminous applications for weatherproofing, and protecting metals against corrosive atmospheric conditions. It thus releases zinc ordinarily used for galvanizing which is vitally needed for war purposes. The Coated Products process uses "Plastipitch," a pitch of improved plastic char-



Plastipitch protected steel roofing on a defense plant extension in the Pittsburgh area

acteristics. This "Plastipitch" is used in a simple bonding process and is said to weatherproof completely all types of metals of various sizes, shapes, forms, or gauges.

In the Coated Products process, only prefabricated or preformed metals are used. No further shaping or forming is required after the "Plastipitch" application is completed, thus avoiding possible rupture of the coating bond and strains in the metal which may result from further mechanical processing.

An outstanding characteristic of the Coated Products process is its ability to provide special climatic or weather resistant qualities as may be required to meet arctic or subtropic conditions. This is accomplished by appropriately modifying the Plastipitch before application to the metal to produce a coating that will not become brittle or chip off at low temperatures, or melt and flow at high atmospheric temperatures.

Coated Products materials are available in various types of finishes and in a variety of colors, fineness and quality of mineral surfaces. Also because of the elimination of many steps formerly required in the older methods, Coated Products materials are said to be very economical to use.

## Goodrich Anti-Static Sandblast Hose

Again putting to practical use its comparatively recent research on electrically conductive rubber and synthetic rubber compounds, The B. F. Goodrich Company, Akron, Ohio, announces a new sandblast hose employing these principles. The new hose has been designated as "B.F.G." The company's previous anti-static sandblast hose which used an internal wire construction for dissipating static charges has been discontinued.

There is no wire used in the new B. F. G. sandblast hose. The rubber compound used carries away the static electricity as fast as it forms. Laboratory tests made on conventional sandblast hose of excellent make and quality showed that the rubber compounds used in them had a resistance exceeding one quadrillion ohms per centimeter cube, while the resistance of the compound used in the new B. F. Goodrich hose is only 3000 ohms per centimeter cube. For the high voltages of static electricity the compound is practically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**INFRA-RED EQUIPMENT CORP.**
**1225 W. Washington Blvd., Chicago, Ill.**

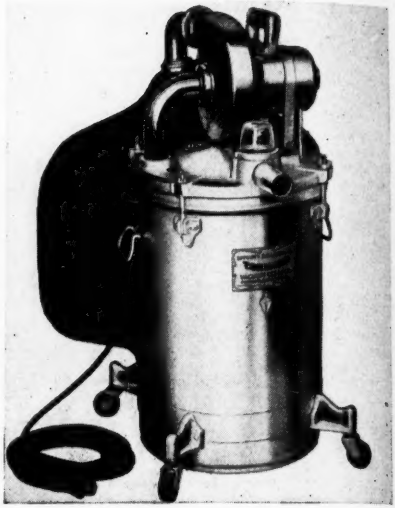
as good a conductor as metal, the company's engineers point out.

Following laboratory tests on the new hose, several thousand feet were placed on test carrying high velocity sand on a large construction job in the far west, where the ordinary highest quality sandblast hose was not able to carry away the electricity and the hose could not be handled by the operator. According to the manufacturer, the new hose performed its task so well under difficult conditions that thousands of feet of it were ordered. It not only carries away the high static charges, but is proving abrasion-resistant to the sharp sand particles.

Goodrich Anti-Static Sandblast Hose is made in four ply construction, with ¼ in. tube, in sizes ranging from ¾ in. to three inches.

## "Tornado" Model 117 Hi-cycle Vacuum Cleaner

To meet the need for a portable, powerful vacuum cleaning unit for production-line cleaning, Breuer Electric Mfg. Co., 5100 N. Ravenswood Ave., Chicago, Ill., has developed the "Tornado" Model 117 Hi-cycle Vacuum Cleaner shown herewith. Besides being light of weight and readily portable, the unit is claimed to have the added features of high speed operation and durability, and is especially suited for continuous heavy duty cleaning. The high rate of speed at which the cleaner operates develops additional suction strength required for picking up welding flux, scrap, heavy particles of dust or dirt, water, and other materials or debris.



"Tornado" Model 117 Hi-cycle Vacuum Cleaner

The Hi-cycle motor of the unit is designed for operation on 220-volt, 180-cycle current only. The cleaner is supplied complete with 20 feet of four-conductor cable but without socket or attachment plug.


**1-9-4-?**

Some year the war will end.
Swords will be beaten back into plowshares, and golf clubs and refrigerators.
There will be a swing back into the things we buy because we like them and not because they are a grim necessity.
You are planning these things now, or should be.
Let us plan with you toward the finish for 194?, whenever it is.
We welcome any call for co-operation on long-range planning for the finish of the future.
Meantime, for 1942 and as far as we can see, we shall do our utmost to supply our customers with the best available materials and service permitted by wartime conditions.

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## "Roxaneal" Protective Liquid Coating for Glass

Known as "Roxaneal," a liquid coating which when applied to glass is said to prevent it from flying during air raids is now being manufactured by Roxalin Flexible Finishes, Inc., Elizabeth, N. J. The material is not claimed to stop glass from fracturing but, according to the manufacturer, tests have proved that it will keep broken glass in place, thus preventing dangerous glass splinters from flying.

Plain Glass Coated with Roxaneal. Note how Glass Remains Intact After Fracturing

Roxaneal is available in a clear, transparent form which does not obstruct vision or light, also in a blackout type. The material may be applied by brushing on the interior of clean glass. According to the manufacturer, windows to which Roxaneal has been applied may be cleaned when necessary with mild soap solutions without affecting the strength of the protective film.

## Lyon Hand-Operated Hydraulic Truck

The Lyon-Raymond Corp., 911 Madison St., Greene, N. Y., has introduced a heavy duty hand-operated hydraulic truck for handling long strips of sheet metal. The truck is designed to keep sheet metal at a convenient height for the operator while feeding the sheets to a punch press.

The unit has a maximum capacity of 10,000 lb. and is equipped with a two-speed hand-operated hydraulic pump. It is also equipped with an attachment which permits a towing hitch to be mounted on the front wheels so that the truck may be conveniently moved with the aid of an industrial power tractor. In addition, the truck is provided with a brake or floor lock which enables it to be locked in position when the operator is feeding sheets into a punch press.

The truck shown in the illustration is of the toggle lever type, with 10,000-


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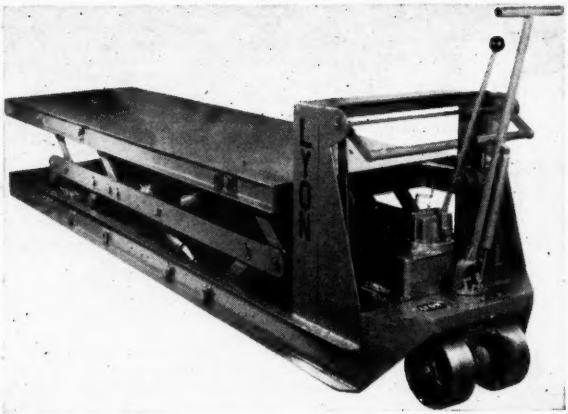
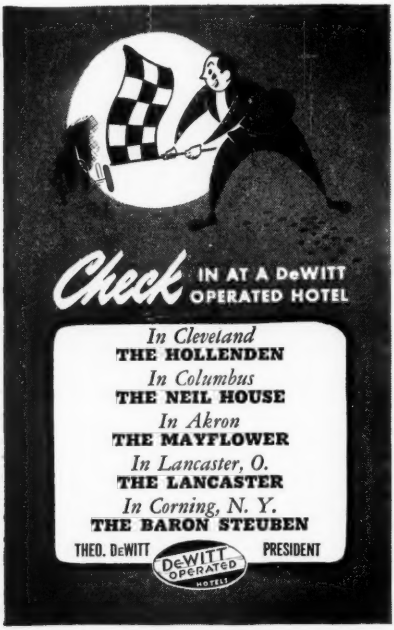



Lyon Hand-Operated Hydraulic Truck

lb. capacity, fifth wheel steer, two-speed hydraulic hand pump, and front fork arranged for installation of towing hitch. The truck is equipped with a table which is 36 inches wide x 120 inches long and has a lowered height of 18 inches and elevated height of 36 inches. The truck can also be furnished with other capacities and specifications and also with motor-driven pump instead of two-speed hydraulic hand pump.

## "Filtaire" Portable Dust Collector

Known as the "Filtaire," a portable dust collector particularly suited for use with grinding and polishing machines where no central dust collecting system is available is announced by the Edward Blake Co., 634 Commonwealth Ave., Newton Centre, Mass. The motor and fan are located behind a replaceable Dustop filter so that all bearings are protected from dust and grit. The

2 x 16 x 20-in. Dustop filter is made from fireproof spun glass, and is large enough so that, in certain cases, it may be inverted and the other half used when the first becomes filled. The purified air is expelled through a right angle elbow at the back of the dust collector, thus creating air circulation overhead.

The Filtaire Dust Collector is easily portable from one machine to another. The top of the unit is adjustable 7 in. horizontally and 20 in. vertically so that it may be positioned correctly for any

"Filtaire" Portable Dust Collector

machine, wheel, or type of work being produced. The Filtaire is a complete, self-contained unit and can be readily operated by simply plugging the electrical connection into the nearest 110-volt outlet.

---

To "Keep 'em Flying" you must "Keep on Buying" Defense Savings Bonds and Stamps regularly.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**Metals Protection Plating Co.**
**1328 Locust St. Kansas City, Mo.**

THIS Opportunity Section is available for classified advertisements featuring equipment, employment, business opportunities, etc., in the industries devoted to the cleaning, plating, polishing and finishing of metals. For advertising rates and other information address:

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# FOR YOUR Catalog LIBRARY

*To obtain copies of the catalogs listed here, indicate on the coupon the number of the item in which you are interested and mail as directed.*

**1. Fostoria Industrial Service**

An 8-page folder showing the strategic locations of Fostoria Service Centers is now being issued by The Fostoria Pressed Steel Corporation, Fostoria, Ohio.

**2. Rolock Wire Mesh Baskets**

Construction specifications and applications of Rolock Wire Mesh Baskets are contained in a 12-page catalog which is now being issued by Rolock, Incorporated, 1350 Kings Highway East, Fairfield, Connecticut.

**3. Sarco Temperature Regulators**

Bulletin No 600 which is now being issued by Sarco Company, Inc., 475 Fifth Ave., New York City, illustrates and describes Sarco Temperature Regulators for heat control in industry.

**4. Universal Centrifugal Acid Pumps**

The United States Stoneware Co., Akron, Ohio, is now issuing bulletin No. 702 in which is described Universal Centrifugal Acid Pumps for hot or cold corrosive solutions.

**5. High Pressure**

A new house organ containing a review of recent developments in fire protection and in the handling of compressed gases is now being published by Walter Kidde & Company, Inc., 631 West St., Bloomfield, New Jersey.

**6. Metal Cleaning with DuBois Products**

Various methods of metal cleaning such as solvent, soaker tank, mechanical washing machines, and electrolytic cleaning are described in a bulletin now being issued by The DuBois Company, 1120 W. Front St., Cincinnati, Ohio.

**7. Automatic Spray Finishing Machines**

A beautifully illustrated eight-page catalog showing automatic spray finishing machines for munitions and arms plants and for industry is now being issued by Spray Engineering Company, 114 Central St., Somerville, Massachusetts.

**8. Infra-Red Paint Drying Equipment**

Infra-Red Equipment Corp., 1225 W. Washington Blvd., Chicago, Ill., is now issuing a four-page bulletin designed to tell how infra-red rays can help paint drying.

**9. Metal Cleaning in War Time**

The Magnus Chemical Company, Inc., 208 South Ave., Garwood, N. J., manufacturer of industrial cleaning materials, emulsifying agents and metal working lubricants, is now issuing this new 50-page, illustrated handbook.

**10. Despatch Laboratory Ovens**
Bulletin No. 105, now being issued by Despatch Ovens Company, 722 Central Ave., Minneapolis, Minn., describes fully a new line of Despatch Chemical Laboratory Forced Draft Ovens.

**11. Metal Parts Cleaning Equipment**
Colt Autosan Metal Parts Cleaning Equipment is described in a 12-page catalog now being issued by Colt's Patent Fire Arms Mfg. Company, 1933 Van Dyke Ave., Hartford, Connecticut.

**12. Heil Process Equipment**
The construction of process equipment with chemical resistant materials is described in a catalog now being issued by Heil & Company, 12903 Elmwood Ave., Cleveland, Ohio.

**13. Brightboy for Polishing and Finishing**
An eight-page booklet describing Brightboy; what it is, what it does, is now being issued by Brightboy Industrial Division, Weldon Roberts Rubber Co., 351 Sixth Ave., Newark, New Jersey.

**14. Data on Production Facilities**
The Kirk & Blum Mfg. Co., 2816 Spring Grove Ave., Cincinnati, Ohio, is now issuing a catalog containing an abundance of information on the facilities of this company which are available to those who require sheet metal fabrication.

**15. Burring With the Lea Method**
An eight-page bulletin covering the Lea method of burring is now being distributed by Lea Manufacturing Co., 22 Cherry St., Waterbury, Connecticut.

**16. Spray Booth Cleaning Compounds**
Triad WS and WSF spray booth cleaners for use respectively in booths where oil base paints and enamels are sprayed are described in a new leaflet issued by Detroit Rex Products Company, 13017 Hillview Ave., Detroit, Mich. It tells how vital parts of spray booths may be kept from being fouled by paint pigments.

**17. Scientific Metal Cleaning**
Four types of metal cleaners covering practically every metal cleaning operation are described in a bulletin which is now being issued by The DuBois Company, 1120 W. Front St., Cincinnati, Ohio.

**18. Lixol Metal Cleaner**
A solvent emulsion-type metal cleaner known as "Lixol" is described in a booklet which is now being issued by Cowles Detergent Company, 7016 Euclid Ave., Cleveland, Ohio.

**19. Incendiary Bomb Coating Units**
Semi-automatic air painting units for coating interiors of incendiary bombs, 20 mm., 37 mm., and 40 mm. shells are described in a bulletin designated as F2-42 now being issued by Paasche Airbrush Co., 1910 Diversey Pkwy., Chicago, Illinois.

**20. Prep Products**
Four materials which help to provide a firm and lasting bond between all kinds of metal surfaces and paint finishes—known as Galvaprep, Prepwash, Preprite, and Metalprep—are described in a folder now being issued by Neilson Chemical Co., 6564 Benson St., Detroit, Michigan.

**21. Black-Magic Products**
Five Black-Magic metal finishes are described in a catalog which is now being distributed by The Mitchell-Bradford Chemical Co., Seymour St., off Bruce Ave., Bridgeport, Connecticut.

**22. Hard Chromium Plating**
A 16-page data bulletin summarizing the applications of industrial chromium plating is now being issued by United Chromium, Inc., 51 East 42nd St., New York City.

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